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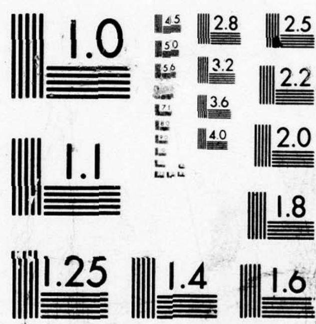

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BLACK RIVER WATERSHED
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SIXTH LAKE DAM
HAMILTON COUNTY, NEW YORK

NY 318
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by

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For

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.
Sixth Lake Dam was judged to be unsafe, non-emergency due to a seriously inadequate spillway. Additional maintenance actions were also recommended.

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2 OCT 1978

NANEN-F

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

The purpose of this letter is to inform you of a clarification of the guidelines used by this office in assessing dams under the National Program of Inspection of Dams.

Office of the Chief of Engineers has recently provided a clarification that dams with seriously inadequate spillways are to be assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The following dams in your state have previously been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. They are now to be assessed as unsafe:

I.D. NO.	NAME OF DAM
N.Y. 59	Lower Warwick Reservoir Dam
N.Y. 4	Salisbury Mills Dam
N.Y. 45	Amawalk Dam
N.Y. 418	Jamesville Dam
N.Y. 685	Colliersville Dam
N.Y. 6	Delta Dam
N.Y. 421	Oneida City Dam
N.Y. 39	Croton Falls Dam
N.Y. 509	Chadwick Dam (Plattenkill)
N.Y. 66	Boyds Corner Dam
N.Y. 397	Cranberry Lake Dam
N.Y. 708	Seneca Falls Dam
N.Y. 332	Lake Sebago Dam
N.Y. 338	Indian Brook Dam
N.Y. 33	Lower(S) Wiccopee Dam (Lower Hudson W.S. for Peekskill)

NANEN-F
Honorable Hugh L. Carey

I.D. NO.	NAME OF DAM
N.Y. 49	Pocantico Dam
N.Y. 445	Attica Dam
N.Y. 658	Cork Center Dam
N.Y. 153	Jackson Creek Dam
N.Y. 172	Lake Algonquin Dam
N.Y. 318	Sixth Lake Dam
N.Y. 13	Butlet Storage Dam
N.Y. 90	Putnam Lake (Bog Brook Dam)
N.Y. 166	Pecks Lake Dam
N.Y. 674	Bradford Dam
N.Y. 75	Sturgeon Pool Dam
N.Y. 414	Skaneateles Dam
N.Y. 155	Indian Lake Dam
N.Y. 472	Newton Falls Dam
N.Y. 362	Buckhorn Lake Dam

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dams as soon as practicable.

It is requested that owners of these dams be furnished a copy of this letter and that copies be permanently appended to all reports previously furnished to you.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

BLACK RIVER WATERSHED
MIDDLE BRANCH MOOSE RIVER BASIN
HAMILTON COUNTY, NEW YORK

SIXTH LAKE DAM
HUDSON RIVER-BLACK RIVER REGULATING DISTRICT
NDS # NY 318
NYSDEC # 140-860

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared by

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For

DEPARTMENT OF THE ARMY
New York District, Corps of Engineers
26 Federal Plaza
New York, New York 10007

21 August 1978

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PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam: Sixth Lake Dam

Owner: Hudson River-Black River Regulating District

State Located: New York

County Located: Hamilton

Stream: Middle Branch Moose River

Date of Inspection: 18 July 1978

Inspection Team: Converse Ward Davis Dixon
91 Roseland Avenue, P.O. Box 91
Caldwell, New Jersey 07006

Based on our visual inspection, a review of the available data and engineering computations, and calculations performed as part of this study, the Sixth Lake Dam is judged to be in generally good structural condition and functioning satisfactorily at this time. Our hydrologic computations, however, indicate that the overflow spillway cannot pass the Probable Maximum Flood (PMF) without the dam being overtopped. Therefore, based on the screening guidelines established by the Department of Army, Office of the Chief of Engineers (OCE), the spillway capacity is rated as inadequate. In addition, the spillway is considered seriously inadequate since all the conditions established by the OCE guidelines for determining seriously inadequate spillway capacity are satisfied. Since this assessment was based on OCE screening criteria and approximate computational techniques, a detailed hydrologic and hydraulic evaluation of the watershed and overflow spillway should be performed by the use of more precise and sophisticated methods and procedures. Following such an investigation, the need for, and type of, mitigating measures should be determined. Until such a study is completed and the spillway adequacy issue resolved, around-the-clock surveillance of the dam should be provided during periods of unusually heavy precipitation.

Our assessment of the general physical condition of the Sixth Lake Dam has led us to make the following recommendations which should be implemented as soon as practicable, certainly within the next three years:

1. Injection epoxy grouting of all leaks in the subspillway compartments should be undertaken.

2. The weep holes in the base slab of the subspillway should be reopened.

3. All deteriorated concrete on the spillway/gate house structure should be repaired.

4. The source of embankment seepage at the base of the downstream end of the left retaining wall should be determined, and the seepage stopped or controlled.

5. Vegetative growth on the upstream embankment should be trimmed as soon as possible, preferably before the end of this year. Shallow rooted trees on the embankment should be cut down; deep rooted trees should remain.

6. The clogged air vent above the right gate should be freed.

7. An emergency warning procedure should be formulated and officially presented to local police authorities as soon as possible, preferably within one calendar year.

8. A specific program for maintenance and periodic inspection of the dam and its appurtenant structures, formalizing current procedures, should be developed for future reference.

Respectfully submitted,

CONVERSE WARD DAVIS DIXON

Edward A. Nowatzki

Edward A. Nowatzki, Ph.D., P.E.

Gary S. Salzman

Date: 21 August 1978

Gary S. Salzman, P.E.

Approved by: Clark H. Benn

Colonel Clark H. Benn
New York District Engineer

Date: 21 September 78

OVERVIEW SIXTH LAKE DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority

The authority to conduct this Phase I inspection and evaluation comes from the National Dam Inspection Act (P.L. 92-367) of 1972 in which the Secretary of the Army was authorized to initiate, through the Corps of Engineers, a program of safety inspections of non-federal dams throughout the United States. Management and execution of the program within the State of New York has been undertaken by the New York State Department of Environmental Conservation (NYSDEC).

b. Purpose

The primary purpose of the inspection is to evaluate available data and to give an opinion as to whether the subject dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Description of Dam and Appurtenances

Sixth Lake Dam is an earth embankment structure approximately 335 feet in length, including a 38-foot long reinforced concrete spillway and gate structure near the right abutment. The embankment has a maximum height of approximately 16 feet at its junction with the left and right abutment walls of the spillway and gate structure. The crest of the embankment is approximately 10 feet wide. The upstream face of the embankment slopes at about 1 vertical to 3 horizontal; the downstream face of the embankment slopes at approximately 1 vertical to 2 horizontal. The upstream slope is rip-rapped with large stone (> 12-inch diameter) from the left abutment wall of the spillway for about 50 feet to where a dock on the left shoreline joins the earth embankment. There is also a boat dock adjoining the earth embankment on the right shoreline.

The spillway and gate structure consists of a gate house and a 25-foot wide rounded-crest spillway section with upstream wing walls. The spillway crest is

5 feet below the dam crest elevation. The upstream face of the spillway is sloped at 11 vertical to 13½ horizontal and the downstream flow surface ends 7 feet above the base slab. The spillway slab varies in thickness from 21 inches at its junction with the base slab to 10 inches at its downstream end. The spillway section is structurally connected to vertical retaining walls on the right and left, and is supported at center span by a concrete buttress. This structural arrangement forms two compartments beneath the spillway slab that can be accessed from downstream (Fig. 1, Appendix D). There are three weep holes in the left retaining wall that empty into the left compartment. Beneath the upstream and downstream ends of the structural slab that supports the spillway and gate house structure, there are 18-inch thick reinforced concrete cutoff walls. These cutoff walls extend to variable depths, as had been determined by the field engineer at the time of their construction.

Immediately downstream from the spillway and gate house structure, there is a concrete apron that extends approximately 12 feet downstream. The vertical retaining walls on both sides of the spillway and gate house structure also extend downstream, decreasing in height from the downstream edge of the dam crest on a 1 vertical to 2 horizontal slope. These retaining walls are structurally connected to the spillway base slab and downstream apron. They extend approximately 13 feet farther downstream than the concrete apron. There is a reinforced concrete buttress that is also an extension of the spillway's right vertical wall. It decreases in height from the downstream edge of the gate house floor on a 1 vertical to 1 horizontal slope, and forms a short separator between the spillway and gate house outlets.

The gate house is located immediately to the right of the spillway section. Its floor and substructure are reinforced concrete; its superstructure is of wood frame construction. The gate house floor is at dam crest elevation and is structurally connected to the right retaining wall of the gate house structure and to the right retaining wall of the spillway section. The gate house contains electrically motorized controls for two 36-inch by 36-inch Ludlow Valve Company gates. The gate sills are approximately 16 feet below the gate house floor or 11 feet below spillway crest. The gates, although motorized, may also be operated manually if the drive motor chain is disconnected from the gate control sprocket. The inlets to the gates are protected by steel grill type trash racks. Since the dam and the spillway/gate house structure are

in an area that is open to the public, there are guard rails on top of all the retaining walls.

b. Location

The dam is located at the western end of Sixth Lake in Hamilton County, N.Y., just north of State Route 28, and approximately 1 mile east of the hamlet of Inlet, N.Y. The location of the dam is shown on Plate 1, which is an area map of the Black River Watershed District, Watertown, N.Y. The location is also shown on the USGS 15 minute Quadrangle Sheet of Old Forge, N.Y., N43°33'00", W74°45'00". Sixth Lake is part of the Fulton Chain and is located on the Middle Branch Moose River which is a tributary of the Black River.

c. Size Classification

The dam is classified as "intermediate" (storage = 6700 acre-feet; height = 16 feet).

d. Hazard Classification

Because there are a number of homes along the stream between Sixth Lake and Fifth Lake, and because there is a school playground within the flood plain of that stream, the hazard classification is "high".

e. Ownership

Hudson River-Black River Regulating District
491 Eastern Boulevard
Watertown, New York 13601

f. Purpose of Dam

The dam was built to create a storage reservoir for recreational purposes on Sixth Lake and to control flow to lakes farther downstream in the Fulton Chain.

g. Design and Construction History

There is no formal design and construction history available for the original wooden crib and concrete structure which was reportedly built in 1904. That structure was replaced by the present dam in 1920. A plan and some sections of the original structure can be found on Plate II, which was prepared by engineers of the State of New York Conservation Commission (NYSCC) in 1920. The application for permit to construct (or reconstruct) a

dam could not be found in the New York State Department of Environmental Conservation (NYSDEC) files for either the original structure or the present structure. Application for a modification is on file (Refer to Appendix E) and it contains information regarding the watershed and pool. Detailed information on the design of the present structure may be found in Plates III and IV, which contain a general layout and plans, sections and details. Additional information on the design may be obtained from a set of support computations (approximately 17 pages) dated June and July 1920 that are on file at NYSDEC. In these computations, it is assumed that the crest of the dam would be raised 10 feet above that shown in the design drawings. The computations then cover the following design considerations:

1) Spillway capacity (length).

2) Structural design of spillway section and floor slab.

3) Factor of safety against overturning (neglecting ice thrust and static uplift pressure) calculated for 13 feet of water over the spillway crest, i.e. for 2 feet of freeboard.

Other important factors, such as the design computations for the retaining walls and wing walls, and a stability computation for sliding, are not included.

There have been no major modifications to the dam since its reconstruction in 1920. In 1929, the concrete gate wall was reinforced by the addition of a 7-foot high trapezoidal section of concrete at its downstream face. The purpose of this modification was to provide mass resistance to movement. (Refer to Application for the Construction or Reconstruction of a Dam, State of New York Department of Public Works, dated 12 November 1929 - Appendix E.)

The concrete spillway section was repaired in the late 1940s and again in 1976. Details of these repairs are not available, although they reportedly involved patching of deteriorated concrete and injection epoxy grouting of leaks in the spillway and retaining walls. Evidence of the latter date repairs was visible on the day of the inspection, and there is a picture report of both repairs on file with the Hudson River-Black River Regulating District (HRBRRD).

Plans of the present gate house superstructure, which was built in 1968, are also on file with the HRBRRD.

h. Normal Operational Procedure

The pool elevation is monitored 6 days a week by a local gatetender of HRBRRD. There is a staff gage to the right of the gate house on the upstream wing wall for this purpose (Fig. 2, Appendix D). The normal operating procedure is to keep the water level of the pool 2 feet below spillway crest elevation during the winter months between November and April, to minimize the effect of ice thrust and to obtain storage capacity for the spring floods. The gates are operated periodically through the winter to keep them from freezing shut.

In the spring, the gates are adjusted to provide 2 inches of opening, and the reservoir is allowed to fill to within 4 to 6 inches of the top of the spillway. The gates are then opened or closed to the extent needed to maintain that level during the summer recreational period. Although either gate may be shut completely, the other gate must be opened not less than 1 inch by law. The right gate is normally left shut during the summer and all regulation is done with the left gate. This procedure is reportedly modified depending upon the amount of spring runoff. This year, for example, runoff was light, so the right gate was shut completely and the left gate closed to 1 inch, the minimum opening allowed by law. There was still not enough water to fill the lake to its normal level, and the pool elevation on the day of the inspection was 18 inches below the spillway crest.

Both gates were partially opened in our presence, one electrically, the other manually. They were both observed to function satisfactorily, both electrically and manually. We were informed that it takes 20 to 30 minutes to fully open the gates, and that with the gates opened fully, it would take approximately 33 hours to drain the lake, assuming no inflow.

1.3 Pertinent Data

a. Drainage Area

The drainage area is approximately 17 square miles.

b b. Discharge at Damsite

Maximum known flood at damsite: 35± cfs (estimated based on 5- to 6-inch maximum reported over spillway).

Total spillway capacity at maximum pool elevation: 1100 cfs (computed).

c. Elevation (ft. above MSL)

Top of dam: 1791.

Maximum pool (top of dam): 1791.

Normal pool: 1785.5±.

Spillway crest: 1786.

Gate sills: 1775.

Downstream sluiceway invert: 1775.

Streambed at sluice outlet: 1773.5±.

d. Reservoir Length

The reservoir includes both Sixth Lake and Seventh Lake.

Spillway crest pool: 3 miles (approximate).

Maximum pool: Unknown.

e. Storage (acre-feet)

Spillway crest pool: 6657.

Maximum pool: 10,500.

f. Reservoir Surface (acres)

Top of dam: 760.

Spillway crest pool: 735.

Recreational (normal) pool: 732 (approximate).

g. Dam

Type: Earthfill

Length: 335 feet (including 38-foot long spillway/gate structure).

Height: Variable; 16 feet maximum at junction of embankment and spillway retaining wall.

Top width: 10 feet at crest.

Side slopes: 1 vertical to 3 horizontal upstream; 1 vertical to 2 horizontal downstream.

Cutoff: Concrete cutoff walls approximately 16 inches thick beneath upstream and downstream ends of base slab extending several feet beyond the right and left abutment walls; founded at elevation 1767.5±. There are 50 feet of wood sheeting beneath the rip-rap to left of spillway in upstream embankment.

Zoning: Unknown - Plate III indicates rock fill.

Impervious core: None indicated.

h. <u>Diversion and Regulating Tunnel</u> - None.

i. <u>Spillway</u>

Type: Concrete; rounded-crest; truncated downstream face.

Length of weir: 25 feet.

Crest elevation: 1786.

Gates: None.

Upstream channel: None.

Downstream channel: Concrete apron at elevation 1775 extends about 12 feet downstream of spillway dropoff.

Other: Weep holes in left side wall and base slab below spillway slab.

j. <u>Regulating Outlets</u>

Type: Two 36-inch x 36-inch vertical lift gates.

Elevation: Gate sills at 1775.

Closure: Manually or electrically operated; manufactured by Ludlow Valve Mfg. Co., Troy, N.Y., Serial Nos. 3763 (14 Dec. 1923) and 853 (27 Oct. 1911).

Access: To gates via downstream portal.

Access: To gate controls via roadway on right embankment to gate house.

Regulating facilities: Gate stands are located in gate house at right spillway embankment.

SECTION 2

ENGINEERING DATA

2.1 Design Data

A moderate amount of design data was available for the subject dam and its appurtenant structures. The sources of the available data include:

a. A set of three design drawings developed by the State of New York Conservation Commission (NYSCC) dated June 1920. These drawings are entitled

1. Plan and Sections of Existing Dam (Plate II)

2. General Layout and Details (Plate III)

3. Plan, Sections and Details (Plate IV)

Information contained on these drawings was used in the computations performed in 1920 (see below) and in the computations that were done as part of this study.

b. Seventeen pages of computations performed in June and July of 1920 at the request of the Division Engineer of the NYSCC. These computations include a commentary (data lacking, errors, omissions, lack of clearness, etc.) on the contract plans and specifications for the subject dam. They concern primarily the spillway capacity (length), structural design of the spillway structure and its base slab, and the evaluation of the safety of the structure with respect to overturning. There are no design computations for the retaining walls and wing walls, and there are no evaluations of the safety of the structure with respect to sliding. The originals of these computations are on file with the NYSDEC.

c. Gate opening records dating back to at least 1938, and gate discharge rating records extending back to August 1968. These data and flow data for the Black River at Watertown and Boonville are available from HRBRRD. A portion of these data is included with the computations in Appendix C.

d. Data relating to watershed and lake impoundment as found in:

<u>Application for the Construction or Reconstruction of a Dam</u>, dated 12 November 1929.

Summary data sheet for Black River Basin Dams. Both of these documents are reproduced in Appendix E.

e. Miscellaneous drawings on file with HRBRRD. These include sketches of the gate stand (Plate V), the electric wiring system for the controls in the gate house, and a complete set of design drawings of the gate house superstructure dated 1968.

f. An album-type picture report of repairs done to the concrete portion of the subject dam in 1948 (?) and 1976. These pictures contain written comments of the repairs, but there is no formal record of the extent or nature of the repairs. This report is on file with HRBRRD.

There are no formal hydraulic/hydrologic computations available other than the spillway design computation of June-July 1920, referenced above.

2.2 Construction

There are no formal records available for either the original construction in 1904, the reconstruction in 1920, or the modifications and/or repairs of 1929, 1948 (?) and 1976.

2.3 Operation

The normal operational procedure as described in Section 1.2h seems to have been followed, as evidenced by the gate opening and gate discharge records referred to above. Mr. Mayhew, assistant chief engineer of the HRBRRD, informed us that the HRBRRD retains a local resident, Mr. James Payne, to operate the gates in the manner described in Section 1.2h, and to take care of the general condition of the dam and gate house structures. There is a local backup gate tender who also has a key to the gate house. Readings of the staff gage are taken daily except Sunday, and water elevations are reported to HRBRRD and USGS. In Mr. Mayhew's recollection, the water level had never risen to more than 6 inches above the top of the spillway.

2.4 Evaluation

a. Availability

Engineering data were provided by the New York State Department of Environmental Conservation (NYSDEC) and by the owner, Hudson River-Black River

Regulating District (HRBRRD). The owner's representative and assistant chief engineer, Mr. Kenneth H. Mayhew, accompanied us on the inspection and personally operated the gates for us. Mr. Mayhew was very cooperative and provided us with whatever information we requested.

b. <u>Adequacy</u>

The nature and amount of engineering data are limited in the following areas:

1. Hydrology: There are no rainfall/runoff data for the local basin or for the Black River Watershed. Although there are flow data available for the Black River at Watertown and Boonville, there is no validated HEC-1 model available at this time. Consequently, hydrological analyses that were performed as part of this study extrapolated data from the adjacent Upper Hudson River Watershed.

2. Soil Mechanics: There are no engineering data available on the earth fill materials (size distribution, strength properties, permeability, etc.) or zoning, so no stability analysis of the earth embankment could be performed. However, the embankment appears to have been designed in accordance with conventional engineering procedures for relatively small earthfill dams (e.g. 1 vertical to 3 horizontal upstream slopes and 1 vertical to 2 horizontal downstream slopes).

The computations performed in 1920 seem to be adequate for the topics they addressed. In some instances, however, the equations or methods of approach used in the computation are not universally recognized, and appear to be agency-adopted, e.g. the McKim formula for determining spillway capacity. As indicated previously, the stability computations were performed for overturning resistance only and not for sliding resistance. Ice thrust and uplift pressures were neglected. Although operational procedures, such as lowering of the lake level during the winter, can compensate for the effect of ice thrust, the question of uplift pressure cannot be dismissed as easily. The design drawings call for weep holes in the base slab; there is no indication, however, of the type of material the weeps are draining, i.e. the design drawings do not show a drainage system to exist beneath the base slab. It is possible that the weeps may be clogged. The question, therefore, arises about the efficiency of the weeps, and whether or not there is some amount of uplift pressure acting on the base slab. This matter is important for two reasons: uplift pressures

result in a force that tends to overturn the dam; in addition, uplift pressures reduce the net normal force acting at the base-slab/foundation-material interface which, in turn, reduces the frictional resistance to sliding. The effect of including even a nominal amount of uplift is demonstrated by the stability computations performed as part of this study, and will be discussed in detail in Section 6.

c. Validity

There appears to be no reason to question the validity of the information contained on the design drawings or the accuracy of the gate opening and gate discharge measurements. The 1920 computations were checked and they appear to be correct within the assumptions made. There appears to be no reason to question the validity of some of the approaches used, even though they are not universally recognized.

SECTION 3

VISUAL OBSERVATIONS

3.1 Findings

a. General

The Sixth Lake Dam is an earthfill structure that impounds both Sixth Lake and Seventh Lake on the Fulton Chain in Hamilton County, New York. The lakes are used exclusively for recreational purposes, and there are many vacation cottages along the shorelines of both lakes.

Sixth and Seventh Lakes are at the same elevation with the connection occurring through a free inlet beneath a steel truss bridge (Fig. 3, Appendix D). The opening is approximately 35 feet wide from abutment to abutment, and the distance from the bottom of the bridge steel to the top of water was approximately 11 feet on the day of the inspection. Judging from the high water stains on the bridge abutments, this structure does not appear to seriously constrict flow from Seventh Lake to Sixth Lake.

The shoreline in the immediate area of the dam is quite active. There is a seaplane base on the left upstream shoreline and a small cluster of summer homes on the right upstream shoreline. In 1973, a boat dock and launch ramp were built just upstream of the right abutment and deeded over to the local community.

b. Dam

1. Embankment

The earth embankment section of the dam appeared to be in generally good condition. Inspection of the upstream face to the left of the spillway section disclosed that the rip-rap was in place and in good condition. Some brush and small trees were beginning to grow above the rip-rap line on the left embankment (left side of spillway). (Refer to Overview Photo.) Inspection of the concrete wing wall on the upstream side of the left embankment revealed that there was a large spall (steel exposed) just at the water line near the spillway approach. The rock crib of the original structure could be seen submerged just upstream of the wingwall near its junction with the left side wall of the spillway.

The crest of the left embankment is about 10 feet wide and was covered with well-trimmed grass on the day of the inspection. A pathway on the crest leads to the left side wall of the spillway, which is also the left retaining wall of the spillway/gate house structure. There is a guard rail on the wall to protect the public from accidentally walking off the edge of the embankment (Fig. 4, Appendix D).

The downstream face of the left embankment was overgrown with brush, and with deciduous and evergreen trees up to 40 feet high. A small drainage channel was noticed starting near the junction of the embankment and the left abutment and leading to a small swampy area at the toe of the dam. It was impossible to tell if the wetness was due to slight seepage through the dam or the result of ponding from the previous day's rain. In either case, the amount of water involved was not significant and the condition is not considered to be serious.

The right embankment is the shorter of the two embankment sections, and it too appeared to be in generally good condition. The upstream portion of the embankment is contained by a reinforced concrete wing wall (Refer to Overview Photo). Ground cover on the shortened slope was well-trimmed and maintained. There is a well-used parking area on the crest of the right embankment with room for one car. The downstream face of the right embankment is also heavily wooded. No seepage or wet areas were noted there.

2. Spillway Structure

On the day of the inspection, there was no flow over the spillway section. The crest appeared to be in generally good condition, with signs of only minor erosion. It was apparent that the spillway face, and especially the structural joint at the center of the spillway, had been patched recently (Fig. 5, Appendix D). The left side wall of the spillway is also the left retaining wall between the spillway/gate house structure and the left embankment. The right side wall of the spillway is the left support wall of the gate house. The right support wall of the gate house is also the right retaining wall between the spillway/gate house structure and the right embankment.

Inspection of the right and left side walls of the spillway disclosed minor erosion at and below the water line, but they were both in generally good condition. A large spall was noticed at the bottom of the downstream

end of the left side wall, immediately adjacent to the embankment (Fig. 6, Appendix D); a moderate amount of seepage was occurring between the wall and the embankment and, from the water stains on the concrete, it appeared that the seepage had been going on for some time.

Inspection of the compartment under the left spillway section revealed moderate spalling of the concrete on the walls and underside of the spillway. Moderate seepage was occurring from the left side spillway retaining wall (Fig. 7, Appendix D) and near the upstream junction of the spillway section and the base slab (Fig. 8, Appendix D). Some seepage was also noticed coming from the weep holes in the left side retaining wall. The base slab weep holes could not be located, and may have been inadvertently covered with material from the repairs done in 1976. The floor of the compartment was quite wet with puddled water. Inspection of the compartment under the right spillway section also revealed moderate spalling of concrete on the walls and underside of the spillway, but there was only minor seepage occurring through the spillway section (Fig. 9, Appendix D). No weep holes were noticed.

c. Appurtenant Structures

The gate house substructure including the gate portals is in generally good condition. There is some minor erosion of the base slab and right retaining wall footing just downstream of the portal openings (Fig. 10, Appendix D). The massive concrete buttress installed in 1929 is also showing signs of minor cracking and scaling (Fig. 11, Appendix D). The air vent for the right gate was clogged with small debris.

The gate house superstructure is in generally good condition. It is a wood frame structure and has been recently painted. The area around the structure is well maintained and guard rails protect the public from accidentally falling off the retaining walls. No-trespassing signs are clearly displayed (Fig. 12, Appendix D). The interior of the gate house is well lighted and clean. The gate stands are readily accessible and appear to be well maintained (Fig. 13, Appendix D).

The right and left retaining walls of the spillway/gate house structure are in generally good condition. The concrete shows signs of minor erosion. As indicated previously, there is a large spall at the base of the downstream end of the left retaining wall (Fig. 6, Appendix D). It is probably due to freezing and thawing

of the water seeping through the embankment along the wall-embankment interface. A small undermining of the embankment was noticed at the downstream base of the right retaining wall also, but it was impossible to tell if it was due to seepage or was the result of the height of tailwater after opening of the gates.

The guard rails on both retaining walls are solidly anchored to the concrete and appear to be well maintained.

d. Reservoir Area

The reservoir area is heavily wooded. Slopes average approximately 1 vertical to 6 horizontal along the immediate shoreline (Fig. 14, Appendix D). They become steeper (about 1 vertical to 3 horizontal) farther inland, especially along the right shoreline. There is no evidence that sedimentation is a problem. The land surrounding both Sixth and Seventh Lakes is zoned primarily for recreational use with some commercial lots. The area is not developing rapidly and the current land usage is not expected to change.

e. Downstream Channel

The downstream channel is generally free of obstructions, with only a few large rocks in the natural streambed immediately downstream of the dam (Fig. 15, Appendix D). Slopes in the vicinity of the dam are relatively shallow at about 1 vertical to 4 horizontal, but the channel narrows farther downstream and side slopes steepen to about 2 vertical to 3 horizontal. The stream passes under State Route 28, approximately 500 feet downstream from the dam, through a 10-foot by 10-foot reinforced concrete box culvert (Fig. 16, Appendix D). The crown of the culvert is at least 10 feet below the roadway. The concrete culvert appeared to be in generally good condition. However, it is possible that the culvert may not be able to pass extremely heavy flows and, with the steep stream channel slopes near its entrance, there may be overtopping of the roadway embankment.

There are no houses along the stream between the dam and State Route 28. However, a short distance downstream of the Route 28 culvert, very close to the stream, there is a camper that is apparently being used by someone who is building a permanent home on the site. Farther downstream, there is a school house whose playground also approaches the stream. Still farther downstream, there is considerable development on the shores of Fifth Lake.

3.2 Evaluation

The subject dam and its appurtenant structures seemed to be in generally good condition, and are expected to continue to function satisfactorily under normal conditions. There was nothing observed at the time of the inspection to indicate that the structure is unsafe. The embankment and spillway/gate house structure appeared to be very well maintained. The seepage noted in the compartments under the spillway slab and at the base of the left retaining wall are not considered serious at this time, although steps should be taken to assure that those conditions do not worsen. Recommendations in this regard are made in Section 7.

The presence of large trees on the embankment slopes of earthfill dams ordinarily poses a potentially dangerous condition.

a) If the trees are shallow rooted, they could blow over in a major storm, carrying part of the embankment with them.

b) If the trees are deep rooted, the root systems may extend transversely through the embankment. Death of the trees and subsequent decay of the root systems may result in the formation of water passages (pipes.) Such pipes provide natural channels for the seepage of water through the embankment; this may result in erosion of the embankment or in the generation of seepage forces that would adversely affect the stability of the slope.

c) The trees on the downstream face of the subject dam appeared to be well established. A study should be made to establish whether the trees are shallow rooted or deep rooted. If they are shallow rooted, removal is in order; if they are deep rooted, removal would be potentially more dangerous than leaving them in place.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures

Mr. Kenneth H. Mayhew, assistant chief engineer for the Hudson River-Black River Regulating District, informed us that the normal operational procedure in effect for the Sixth Lake Dam is as follows:

a. The water level of the lake is dropped to 2 feet below spillway crest elevation, usually in early November, and kept at that elevation during the winter.

b. In the spring, usually in mid-April, the gates are adjusted to provide 2 inches of opening, and the reservoir is allowed to fill slowly to within 4 to 6 inches of the top of the spillway.

c. The gates are opened or closed to the extent needed during the spring-summer-fall recreational season, to maintain the water level at 4 to 6 inches below the spillway crest. During this period, the right gate is normally left shut and all regulation is accomplished with the left gate. By law, the HRBRRD is required to keep one gate open at least 1 inch to augment downstream flow into the lower lakes of the Fulton Chain.

There are three local year-round residents who tend to the dam. Two of these have keys to the gate house. They lower or raise the gates as required, and attend to the rest of the structure when necessary (e.g. they keep the fish and trash racks clear). In case of an emergency, the sheriff's office reportedly knows that the gate keepers should be called, in addition to Mr. Mayhew, whose office is in Watertown, N.Y.

4.2 Maintenance of Dam

The dam and its appurtenant structures appear to be extremely well maintained. The grass on the crest of the embankment is reportedly mowed regularly, and the upstream slopes are cleared of vegetation once a year.

4.3 Maintenance of Operating Facilities

The gate house structure appears to be generally well maintained. The gate control stands and the

control mechanisms are clean and apparently extremely well maintained. The gate house is lighted inside, and the area around the spillway and gate house can be illuminated at night if necessary.

4.4 Warning Systems in Effect

There is an informal warning system in effect since the local sheriff reportedly knows to call the gate tender(s) and Mr. Mayhew in the event of an emergency. However, there is no formal emergency warning system or plan on file with the local police or sheriff's department.

4.5 Evaluation

The dam and its appurtenant structures appear to be well maintained. The emergency warning system, although satisfactory in principle, is not sufficiently formulated and formalized with local authorities to be considered adequate.

SECTION 5

HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Hydraulic Features

a. Design Data

The computations performed in 1920 used the McKim formula to evaluate the adequacy of the proposed new spillway design. It was found from a consideration of storage available in Sixth and Seventh Lakes that only 13.6 feet of spillway length were required to pass the maximum flood and still have 3 feet of freeboard. However, the assumption was made in those computations that the crest of the dam would be 10 feet higher than that shown in the design drawings. On that basis, the 25 feet of spillway proposed in the design was judged adequate. Unfortunately, the maximum flood as used in the McKim formula was not defined. The flow computed for the 25 feet of spillway in the design computations was 1010 cfs at a depth of 5 feet over the spillway. Our computations (Appendix C) indicate a flow of approximately 1100 cfs under those conditions. Structural details of the spillway section are found on Plate IV.

No design data or details of the outlet gates or computations of flow were available; however, a section of the gate house showing the gate dimensions is given on Plate IV.

b. Experience Data

There are data available from HRBRRD on gate openings and discharge ratings. These data were used in this study to evaluate the coefficient of discharge for the gates. The capacity for both gates in full open conditions under maximum head was then computed realistically as 329 cfs. These computations are contained in Appendix C.

c. Visual Observations

The lake level was below spillway elevation on the day of the inspection, so the performance of the spillway could not be observed. High water marks on the vertical side walls, however, indicated that normal flow over the spillway rarely exceeded a few inches. There is no apparent reason to believe that the spillway would not perform satisfactorily under those conditions in the future.

The outlet gates were both opened on the day of the inspection, and water was observed to flow freely through both gates. There was no significant tailwater buildup. Inspection of the concrete superstructure above the gates disclosed that the vent hole of the right gate was clogged.

5.2 Evaluation of Hydrologic Features

a. Design Data

No hydrologic data (rainfall/runoff records) or analyses could be found in either the NYSDEC or HRBRRD files for the Sixth Lake Dam and watershed. There is a staff gage at Sixth Lake Dam and records of its daily readings are on file with HRBRRD. Flow meaurements for the Black River at Watertown and at Boonville are also available from HRBRRD.

According to the Recommended Guidelines for Safety Inspection of Dams, Department of the Army, OCE, the recommended Spillway Design Flood (SDF) for the subject dam is the Probable Maximum Flood (PMF) since the dam is of "intermediate" size and poses a "high" hazard.

b. Experience Data

Information on the PMF for the Sixth Lake Dam and watershed was obtained from Upper Hudson and Mohawk River Basins Hydrologic Flood Routing Models, a report prepared in 1976 for the Department of the Army, New York District, Corps of Engineers by Resource Analysis, Incorporated. In that investigation, the rainfall-runoff mathematical model HEC-1 was used to reconstitute major historical floods in the basins under study, and to simulate the Standard Project Flood (SPF). In addition to the SPF simulation, the rainfall pattern for Tropical Storm Agnes was transposed to fall directly on the basins under study, and the discharges resulting from this rainfall were determined by an application of the model calibrated by comparison with available gage data. In a telephone conversation with Mr. Thomas Smyth, USACE New York District, we were informed that for Phase I hydrologic analyses, the Probable Maximum Flood (PMF) could be regarded as twice the SPF.

Data contained in the report for Subbasins 36, 37 and 38 of the Upper Hudson River Basin from its source to its confluence with the Sacandaga River were extrapolated to the Sixth and Seventh Lake watershed on the basis of geographic proximity. Flood routing

computations in Appendix C indicate that the SDF is approximately 2600 cfs. As indicated previously, this is also the PMF.

c. Visual Observations

As indicated previously, Mr. Mayhew informed us that the maximum observed flood in his recollection (15± years) occurred when water rose approximately 6 inches above the spillway crest. This would correspond to a flow of approximately 35 cfs, well below the total spillway capacity of 1100 cfs at maximum pool elevation.

d. Overtopping Potential

The computations in Appendix C indicate that the subject dam will be overtopped by the PMF. The maximum height of water that can flow over the spillway without the dam being overtopped is 5 feet. At that height, the spillway passes approximately 1100 cfs. The routed PMF is 2600 cfs. Therefore, the spillway can pass only 42 percent of the PMF. If the two gates are also available to pass flow, then the spillway/gate structure can pass approximately 1430 cfs or 55% of the PMF.

e. Spillway Adequacy

The results of the hydrological analysis indicate that the spillway capacity of the subject dam is inadequate with respect to passing the recommended SDF without overtopping the dam. In addition, the spillway is considered to be seriously inadequate because it satisfies all of the following conditions set forth in DAEN-CWE-HY Engineer Technical Letter No. 1110-2-234 dated 10 May 1978:

1. There is high hazard to loss of life from large flows downstream of the dam.

2. Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

3. The spillway is not capable of passing one-half of the Probable Maximum Flood without overtopping the dam and causing failure.

Overtopping is particularly critical for earthfill dams since overtopping can easily lead to erosion of the embankment and subsequent washout of the dam structure itself. Resulting flows are usually catastrophic.

f. Other

Evaluation of the hydraulic characteristics of the 10-foot by 10-foot concrete box culvert downstream of the dam indicates that it too cannot pass the SDF. Computations in Appendix C show that it has a capacity of approximately 2000 cfs under ten feet of head. This corresponds to 77% of the PMF. Failure of the culvert to pass the PMF would result in overtopping of the State Route 28 embankment and possible flooding of this vital communications link.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

Visual observations of the earth embankment and reinforced concrete spillway/gate house structure did not disclose any signs of structural instabilities, although the walls and roof of the compartments beneath the spillway slab were spalled and leaking. The vertical and horizontal alignments of the right and left embankments appeared satisfactory and there was no evidence of cracks or unusual movement along the crest or downstream toe. There was no significant seepage noted along the junction of the embankment with the left and right abutments or at the toe of the embankment. There was, however, moderate seepage noted at the base of the downstream end of the left spillway retaining wall; it appeared to be occurring along the embankment-retaining wall interface. This conclusion is supported by the fact that there was moderate flow from the weep holes in the left retaining wall into the left subspillway compartment.

b. Design and Construction Data

There are two design drawings (Plates III and IV) and many pages of computations on file with HRBRRD involving the structural design of the overfall section of the spillway/gate house structure.

Included in these design computations of 1920 is an overturning stability analysis for the spillway section. The effects of ice thrust and uplift pressures were neglected in that analysis. It was assumed that the side walls and embankment would be raised 10 feet so that the maximum height of flow over the spillway crest would be 15 feet. In the analysis itself, 13 feet of water were assumed to be flowing over the spillway. The computations performed under these conditions show that the resultant force falls almost at the center of the base, i.e. that the dam is stable against overturning. No factors of safety are given. Since these conditions are far more severe than the conditions of maximum flow without overtopping of the present structure, and even more severe than the 9 feet of spillway overflow that can be expected under PMF conditions, the structure can be considered stable with respect to overturning.

Although it was not checked as part of this study, it is probable that the resultant of forces would still pass within the middle 1/3 of the base even if full uplift pressures were considered, due to the conservative assumptions and the degree of safety in the initial analysis. The existence of uplift pressures beneath the subject dam is possible, since there is no indication that there are subdrains, and the weeps in the base slab are apparently clogged.

The effect of ice thrust is not considered to be significant since the lake is lowered every winter to two feet below crest elevation, and the upstream face of the spillway section is sloped at almost 1 vertical to 1 horizontal.

Stability of the spillway against sliding was not checked in the computations of 1920. Computations performed as part of this study indicate that under present overtopping conditions, including the effects of uplift pressure due to one-half of the hydrostatic head (upstream cutoff wall is assumed to reduce uplift pressures), and the resistance offered by the upstream and downstream cutoff walls, the factor of safety against sliding is approximately 1.7. Ice thrust is neglected for the reasons stated above. This very conservatively ignores the connection of the spillway with the wingwalls and appurtenant facilities (See Plate IV). This tends to indicate that the structure is stable with respect to sliding.

No construction data for the structure and no design or construction data relating to the stability of the embankment were available for review. Since there was no information regarding the nature of the embankment materials or their engineering properties, neither stability nor seepage analyses could be performed as part of this study.

c. <u>Operating Records</u>

There are no formal operating records from which to evaluate the stability of the subject structure. No unusual seepage through the embankment has been reported recently, although a comment in the computations of 1920 indicates that both the right and left embankments of the original structure leaked prior to 1920. Major seepage through the spillway slab was repaired by injection epoxy grouting in 1976. A recent level survey of the spillway crest showed less than 1 inch of differential along its 25 feet of length.

d. Post Construction Changes

The only post construction change of note was the addition of a mass of concrete on the downstream face of the gate house substructure. This was done in 1929 to improve the stability of that portion of the structure (Refer to Appendix E). The repairs performed in 1948 (?) and 1976 were remedial in nature and did not entail any major structural change.

e. Seismic Stability

Sixth Lake Dam is nominally located on the border between Seismic Zone 1 and Seismic Zone 2 according to the Algermissen Seismic Risk Map. The USACE guidelines suggest that in the event of doubt about the proper zone, the higher zone should be used. Although earthquakes that cause moderate damage can be expected to occur in Zone 2, the design and construction practices conventionally used for small earth dams are considered to be adequate in areas of low seismicity, and the safety factors used for static conditions should preclude major damage for all but the most catastrophic earthquakes. However, no computations were performed to evaluate the effect of earthquakes on the subject dam.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

Visual inspection of the system and a review of the available engineering data indicate that the dam embankment and the spillway/gate house structure are in generally good condition, and functioning satisfactorily at this time. Our approximate hydrologic/hydraulic calculations indicate that the discharge capacity of the spillway is seriously inadequate according to the OCE screening guidelines and the criteria set forth in DAEN-CWE-HY Engineer Technical Letter No. 1110-2-234 dated 10 May 1978.

b. Adequacy of Information

The information available to us was not adequate for a detailed analysis of the stability of the earthen embankment portion of the structure. The safety assessment made above is based almost entirely upon visual observation on the day of the inspection, and the fact that the information available indicates that the dam appears to have been designed according to conventional engineering practice (e.g. reasonable slopes). The data were adequate for a reasonable assessment of the spillway/gate house structure's anticipated performance under maximum flood conditions. Since there were no hydrologic computations available, our assessment of the overtopping potential is based solely on extrapolation to the Sixth and Seventh Lakes drainage basin of model results developed and calibrated for the neighboring Upper Hudson River drainage basin.

c. Urgency

Inasmuch as the spillway capacity appears to be seriously inadequate according to the OCE screening criteria, there is some urgency in performing the additional study recommended below. Likewise, since neglect of the spalled surfaces and leakage in the subspillway compartments could lead to further deterioration of the concrete and possibly to serious structural damage, there is also some urgency in performing the repairs recommended below. Finally, since continued seepage through the embankment at the left retaining wall might develop into serious piping, it is moderately urgent that it too be remedied.

d. Necessity for Further Investigations

In view of the serious inadequacy of the overflow spillway alone to pass at least one-half of the computed PMF without the dam being overtopped, and in view of the fact that overtopping in the case of earthfill dams is usually disastrous, and hydrologic and hydraulic evaluation of the watershed and spillway should be performed using more precise and sophisticated methods and procedures. Since the spillway/gate house structure can pass the PMF if both gates are in the full open position, and since there are local caretakers who tend to the dam on a daily basis, the urgency of this study is diminished somewhat. However, it should be performed as soon as possible, certainly within one calendar year of the date of this report. Following this study, the need for, and type of, mitigating measures should be determined. Until such a study is completed, around-the-clock surveillance of the structure should be provided during periods of unusually heavy precipitation.

7.2 Recommendations and Remedial Measures

a. Alterations/Repairs

1. Leakage from the side walls and spillway slab in the subspillway compartments should be stopped. Injection grouting is recommended as a possible means of accomplishing this repair.

2. Concrete spalls in the subspillway compartments should be patched and other areas of deteriorated concrete on the spillway/gate house structure repaired.

3. The weep holes in the base slab of the subspillway should be reopened.

4. The source of the seepage through the embankment at the base of the downstream end of the left retaining wall should be determined and the seepage stopped. This may require grouting part of the embankment near the embankment-retaining wall interface. Alternatively, controlling flow with a subdrainage system may be found to be more appropriate.

5. The low woody growth on the upstream embankment should be cut and the area planted with grass. The large trees on the embankment should be investigated to determine whether they are shallow rooted or deep rooted. If shallow rooted, they should be cut down; if deep rooted, they should remain.

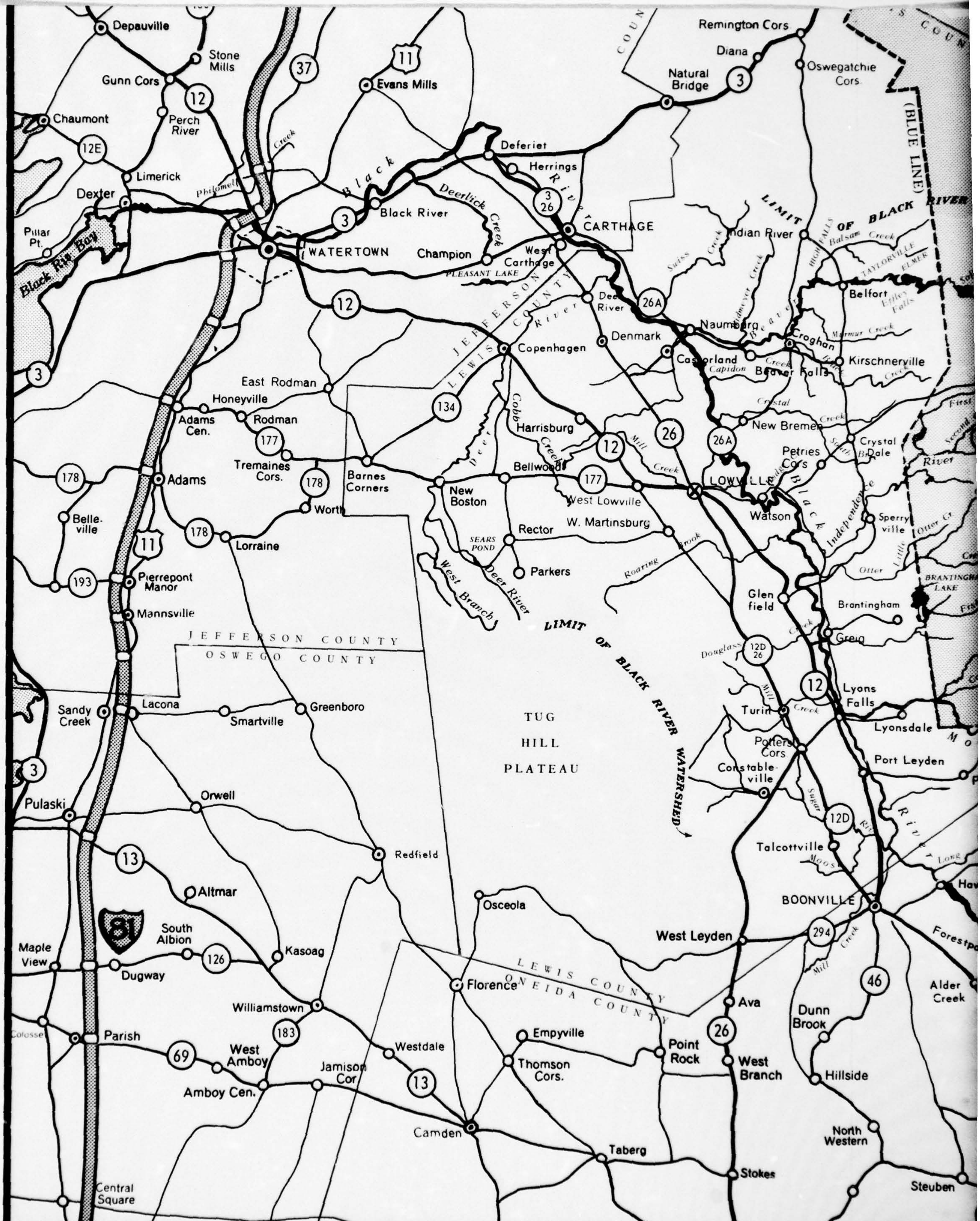
6. The clogged air vent above the right gate should be opened to allow the gate to perform efficiently.

The remedial work recommended above should be accomplished as soon as practicable within the next three years, with the exception of Item 5, which can easily be done this year.

b. Operations and Maintenance Programs

An emergency warning procedure should be formulated and officially presented to local law enforcement and emergency rescue authorities. This document should contain chain-of-command names and telephone numbers in the case of an emergency. Consideration should be given to method of implementation should telephone lines be down, roads closed, etc. The emergency warning procedure should be developed and distributed to the authorities as soon as possible, preferably within one calendar year.

Although it is obvious that under Mr. Mayhew's direction, the facility has been well maintained, a specific program of periodic maintenance of the dam embankment and its appurtenant structures should be established and followed by his successors. This would include definite times for trimming of vegetation on the upstream slope, inspection and repair of concrete structures, testing of gate controls, etc. There is no urgency in developing this formal maintenance procedure, but it should be done within the next few years.



Depauville
Stone Mills
Gunn Cors
Chaumont
Perch River
Limerick
Dexter
Pillar Pt.
Black Riv Bay
Evans Mills
Remington Cors
Diana
Natural Bridge
Oswegatchie Cors.
(BLUE LINE)
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Herrings
Black River
Deerlick Creek
CARTHAGE
WATERTOWN
Champion
West Carthage
PLEASANT LAKE
LIMIT OF BLACK RIVER
Indian River
Belfort
Deer River
Naumburg
Denmark
Copenhagen
Castorland
Croghan
Kirschnerville
Beaver Falls
JEFFERSON COUNTY
LEWIS COUNTY
East Rodman
Honeyville
Adams Cen.
Rodman
Tremaines Cors.
Harrisburg
New Bremen
Crystal Dale
Petries Cors
Adams
Barnes Corners
Bellwood
New Boston
West Lowville
LOWVILLE
Watson
Belle-ville
Worth
Lorraine
Rector
W. Martinsburg
Sperryville
SEARS POND
Parkers
Pierrepont Manor
Mannsville
West Branch
Deer River
LIMIT OF BLACK RIVER WATERSHED
Glenfield
Brantingham
BRANTINGHAM LAKE
Greig
JEFFERSON COUNTY
OSWEGO COUNTY
Lyons Falls
Sandy Creek
Lacona
Smartville
Greenboro
TUG HILL PLATEAU
Turin
Lyonsdale
Potters Cors
Constableville
Port Leyden
Pulaski
Orwell
Redfield
Talcottville
Altmar
Osceola
BOONVILLE
South Albion
Maple View
Kasoag
West Leyden
Dugway
Florence
LEWIS COUNTY
ONEIDA COUNTY
Alder Creek
Williamstown
Ava
Dunn Brook
Colosse
Parish
Empyville
West Amboy
Westdale
Point Rock
Thomson Cors.
West Branch
Hillside
Jamison Cor
Amboy Cen.
Camden
North Western
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Stokes
Central Square
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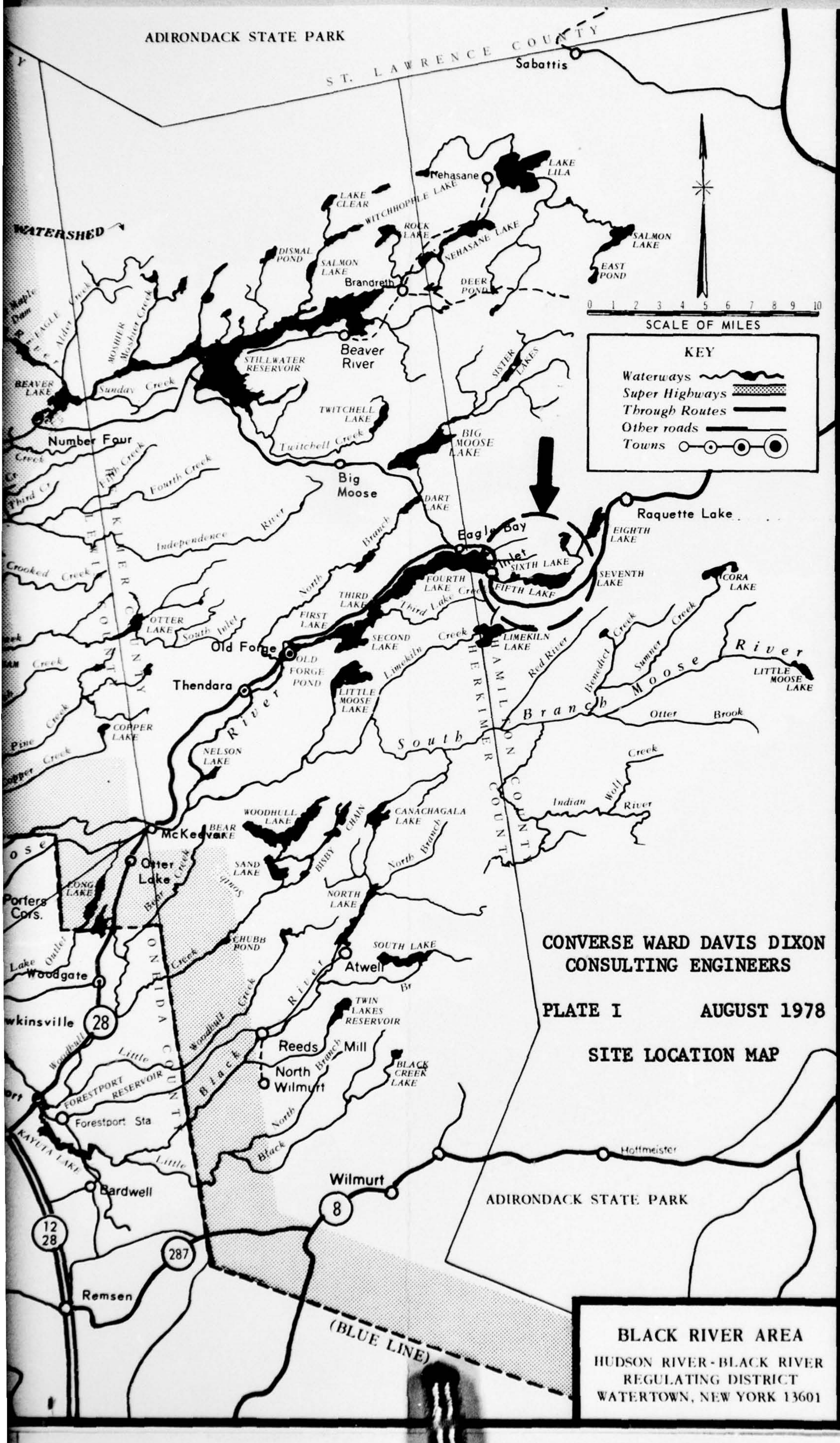
ADIRONDACK STATE PARK
ST. LAWRENCE COUNTY
Sabattis
WATERSHED
LAKE LILA
Nehasane
LAKE CLEAR
WITCHHOPPLE LAKE
ROCK LAKE
NEHASANE LAKE
SALMON LAKE
EAST POND
DISMAL POND
SALMON LAKE
Brandreth
DEER POND
STILLWATER RESERVOIR
Beaver River
BEAVER LAKE
Sunday Creek
SISTER LAKES
TWITCHELL LAKE
Twitchell Creek
Number Four
BIG MOOSE LAKE
Big Moose
Fourth Creek
Fifth Creek
Independence River
DART LAKE
Eagle Bay
Inlet
Raquette Lake
EIGHTH LAKE
SIXTH LAKE
SEVENTH LAKE
FIFTH LAKE
FOURTH LAKE
THIRD LAKE
Third Lake Creek
FIRST LAKE
SECOND LAKE
North Branch
Crooked Creek
OTTER LAKE
South Inlet
CORA LAKE
Old Forge
OLD FORGE POND
LIMEKILN LAKE
Limekiln Creek
Red River
Benedict Creek
Sumner Creek
Moose River
LITTLE MOOSE LAKE
Thendara
LITTLE MOOSE LAKE
South Branch Moose River
Otter Brook
COPPER LAKE
NELSON LAKE
HERKIMER COUNTY
HAMILTON COUNTY
Indian River
Wolf Creek
WOODHULL LAKE
BEAR LAKE
CANACHAGALA LAKE
McKeever
Otter Lake
SAND LAKE
BISBY CHAIN
North Branch
LONG LAKE
Porters Cors.
NORTH LAKE
CHUBB POND
SOUTH LAKE
Atwell
Woodgate
ONEIDA COUNTY
TWIN LAKES RESERVOIR
28
Reeds Mill
North Wilmurt
BLACK CREEK LAKE
Black River
FORESTPORT RESERVOIR
Forestport Sta
KAYUTA LAKE
Bardwell
Hoffmeister
Wilmurt
8
12
28
287
Remsen
(BLUE LINE)
ADIRONDACK STATE PARK
SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10
KEY
Waterways
Super Highways
Through Routes
Other roads
Towns
CONVERSE WARD DAVIS DIXON
CONSULTING ENGINEERS
PLATE I AUGUST 1978
SITE LOCATION MAP
BLACK RIVER AREA
HUDSON RIVER-BLACK RIVER
REGULATING DISTRICT
WATERTOWN, NEW YORK 13601

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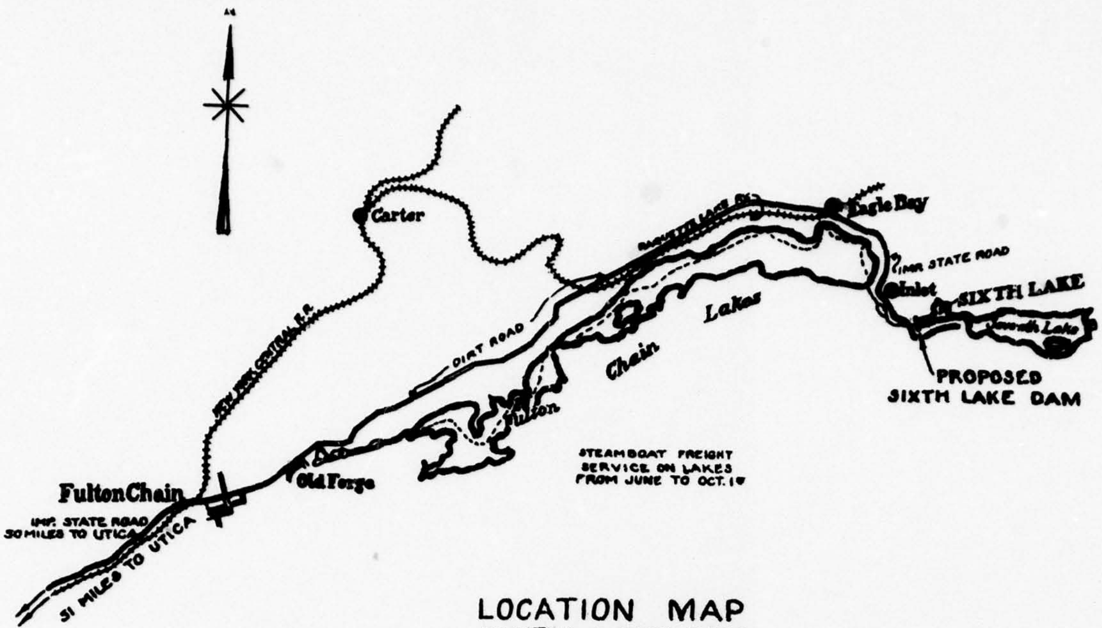
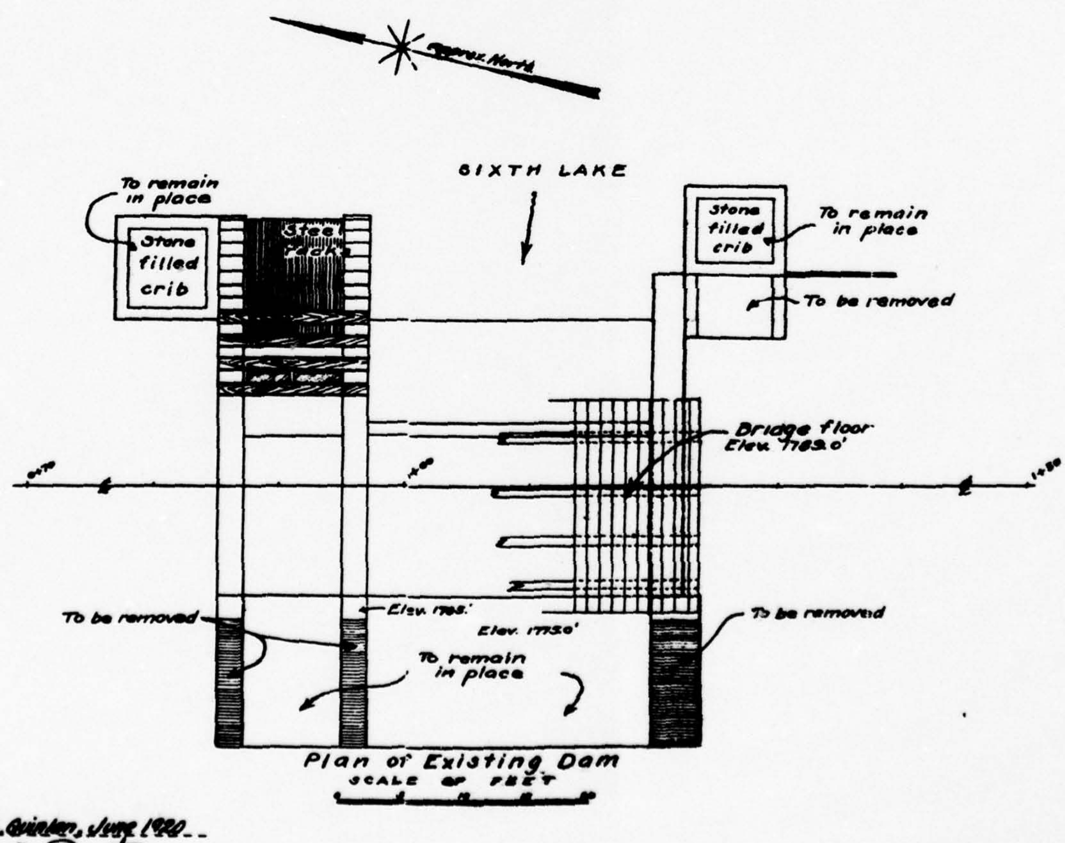
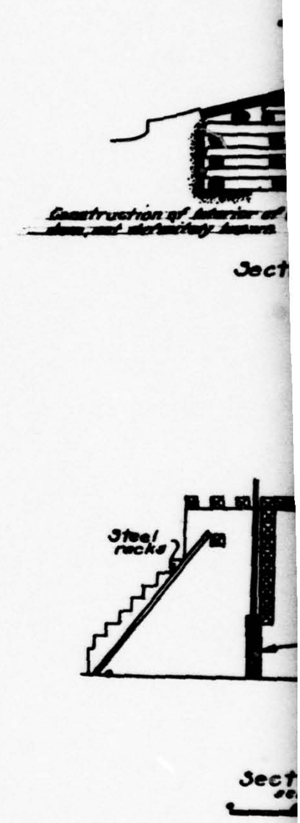


LOCATION MAP
SIXTH LAKE DAM
SCALE OF MILES

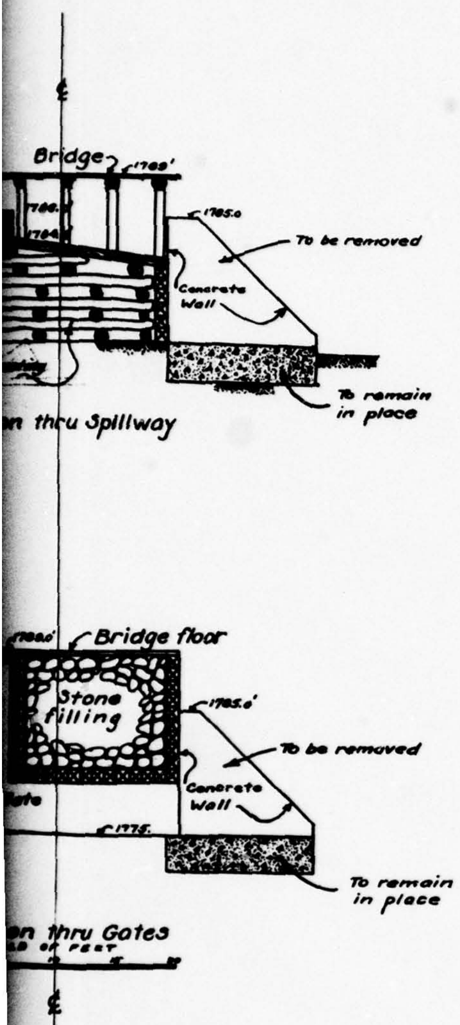


Plan of Existing Dam
SCALE OF FEET



DRAWN BY J.L. Quinlan, June 1920
CHECK BY F. D. Porter

File No. D5



STATE OF NEW YORK
NSERVATION COMMISSION
GEORGE D. PRATT, COMMISSIONER
ALEX. MACDONALD, DEPUTY COMMISSIONER
DIVISION OF WATERS
A.H. PERKINS, DIV. ENGINEER
E.H. SARGENT, SENIOR ASST. ENGINEER
IXTH LAKE DAM
SECTIONS of EXISTING DAM
LEY AND F.D. PORTER, ASSISTANT ENGINEERS
920 SCALES AS INDICATED

Approved A.H. Perkins Div. Engr.

CONVERSE WARD DAVIS DIXON

CONSULTING ENGINEERS

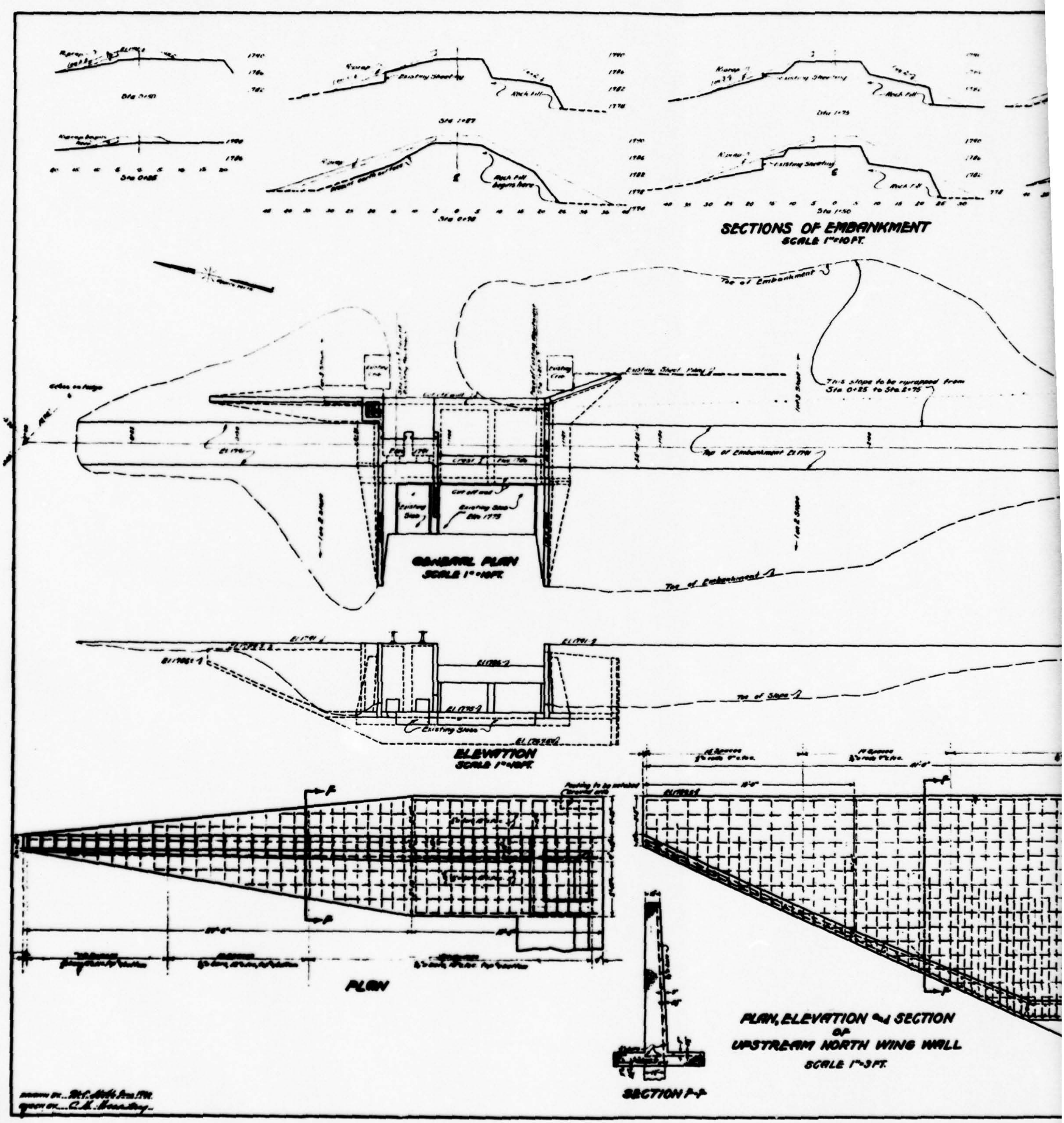
PHASE 1 - NATIONAL DAM SAFETY PROGRAM

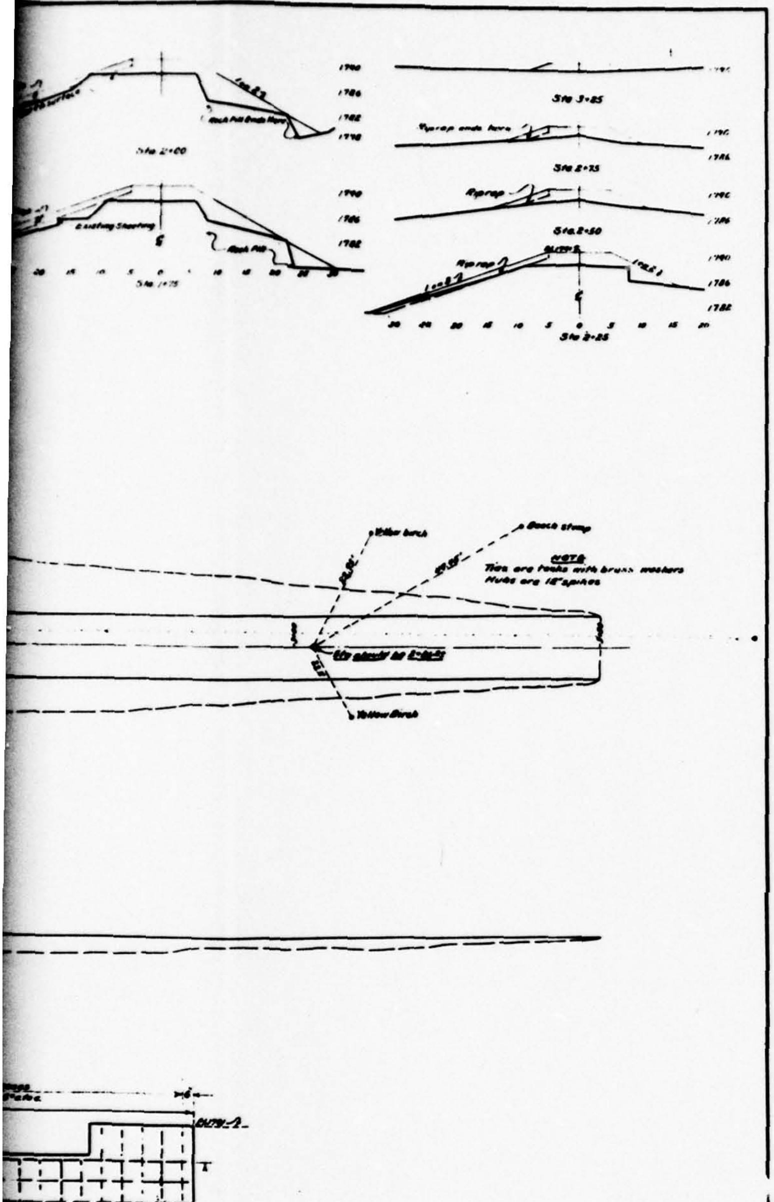
SIXTH LAKE DAM

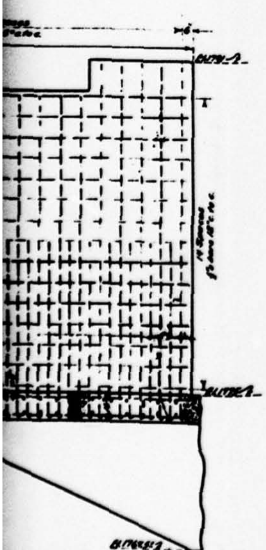
PLATE II AUGUST 1978

MFS, Acc. No 10,469 Sheet No. 1 of 3 She.

2


Existing Sheeting
Rock fill
Rock fill begins here
SECTIONS OF EMBANKMENT
SCALE 1"=10 FT.
Top of Embankment
This slope to be riprapped from Sta 0+25 to Sta 2+75
Existing Sheet Piling
Top of Embankment El 1791
Cut off wall
Existing Sluice
GENERAL PLAN
SCALE 1"=10FT.
Top of Embankment
Top of Slope
Existing Sluice
ELEVATION
SCALE 1"=10FT.
PLAN
SECTION F-F
PLAN, ELEVATION and SECTION
OF
UPSTREAM NORTH WING WALL
SCALE 1"=3 FT.





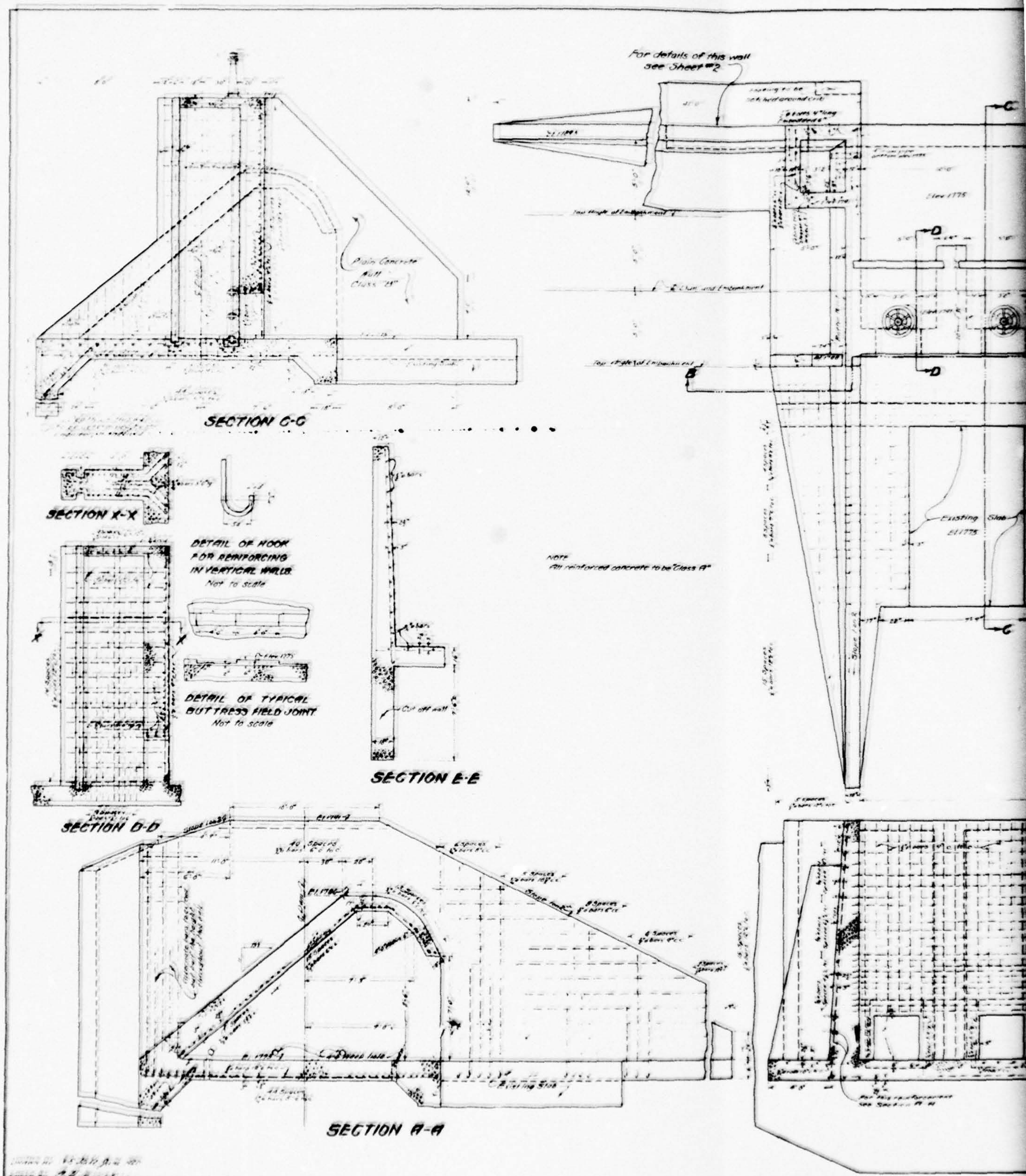
CONVERSE WARD DAVIS DIXON
CONSULTING ENGINEERS
PHASE 1 - NATIONAL DAM SAFETY PROGRAM
SIXTH LAKE DAM
PLATE III AUGUST 1978

STATE OF NEW YORK
CONSERVATION COMMISSION
GEO D. PRATT, COMMISSIONER
ALEX MACDONALD, DEP COMMISSIONER
DIVISION OF WATERS
R.H. PERKINS, DIV. ENGR.
E.H. SARGENT, SR. ASST. ENGR.
SIXTH LAKE DAM
C.H. HURLEY & F.D. PORTER, ASST ENGRS
GENERAL LAYOUT AND DETAILS
SCALES AS INDICATED

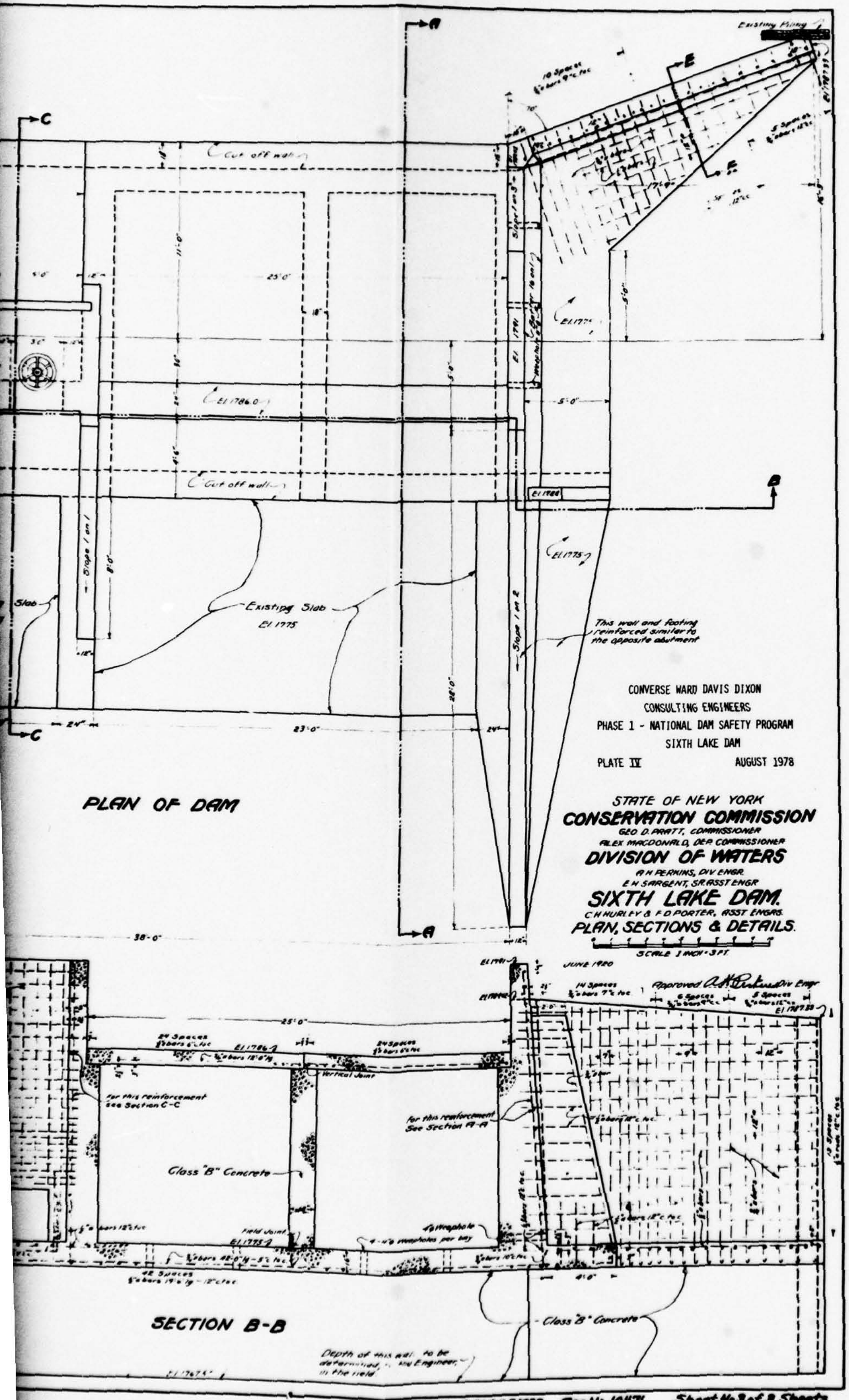
Approved ... Div. Engr.

File No. D 5034 BMPS, Acc. No. 10470 Sheet No. 2 of 3 Sheets.

2



For details of this wall see Sheet #2
Plain Concrete Wall Class "B"
SECTION C-C
SECTION X-X
DETAIL OF HOOK FOR REINFORCING IN VERTICAL WALLS
Not to scale
DETAIL OF TYPICAL BUTTRESS FIELD JOINT
Not to scale
SECTION E-E
SECTION D-D
NOTE
All reinforced concrete to be "Class A"
Existing Slab
SECTION A-A
Existing Slab
Cut off wall



File No. 0503-4 BMFS. Acc. No. 10471 Sheet No. 3 of 3 Sheets.

2

SUBJECT: SKETCH [illegible] GATE STAND
ELECTR. – MOTOR & GEAR REDUCER [illegible]
BY: R. H. MAYHEW DATE: [illegible]
REFERENCE: SIXTH [illegible] GATEHOUSE

FILE NO.
ACC. NO. 10052
SHEET
CONT'D FROM ACC.

Scale 1 inch = 1 Ft

DATA: 2 EACH TO MOTORIZE
- DRIVEN SHAFT 24 RPM (MAX. 3[illegible])
TOR. 540 in LBS (MAX [illegible])

GEAR REDUCER
BOSTON NORM[#] U115.
PAGE 262 5/1
RPM = 1.30
TOR. = 275 [#]

- OUTPUT SPEED - 16 RPM
TORQUE 250 in lbs

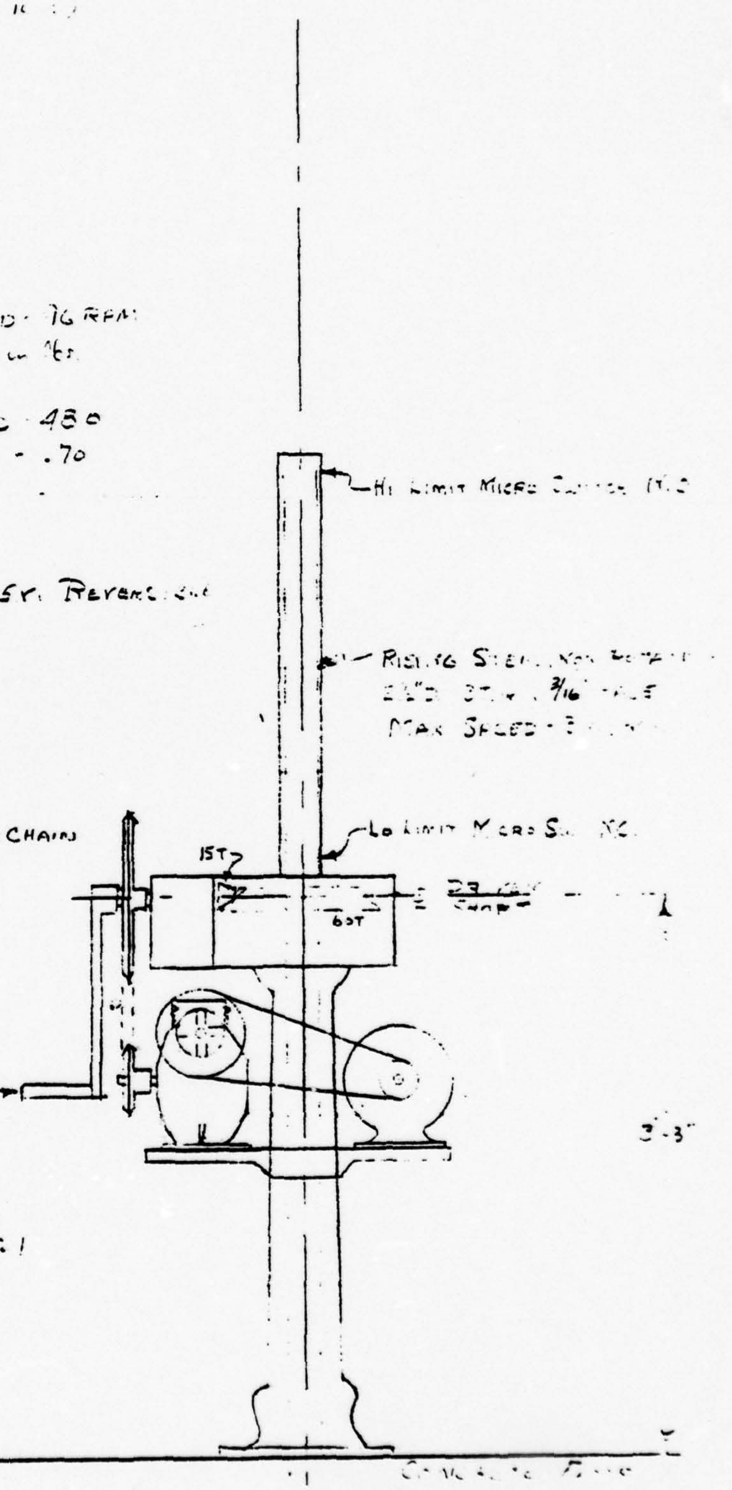
INPUT - SPEED - 480
HP - .70

DRIVE MOTOR 1/4 HP 1750 RPM 115V. REVERSIBLE

SPROCKET DRIVE 4:1
w/REMOVABLE LINK IN CHAIN

14" REMOVABLE HANDLE

V-BELT DRIVE 3:1



CONVERSE WARD DAVIS DIXON
CONSULTING ENGINEERS
PLATE V AUGUST 1978

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

NAME OF DAM: Sixth Lake Dam NDS ID NO.: NY 318

RATED CAPACITY (ACRE-FEET) 6657 NYS DEC ID NO.: 140-860

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1787.5 (controlled by gate openings)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1786.0

ELEVATION MAXIMUM DESIGN POOL: 1791

ELEVATION TOP DAM: 1791.0

CREST (SPILLWAY):

a. Elevation 1786
b. Type Concrete; rounded crest
c. Width Not applicable; crest is rounded
d. Length 25 feet
e. Location Spillover Left of gate house near right abutment
f. Number and Type of Gates 2 - 36"x36" Ludlow Valve Co.

OUTLET WORKS:

a. Type 2 - 36"x36" Ludlow Valve Co.
b. Location Below gate house near right abutment
c. Entrance inverts 1775±
d. Exit inverts 1775±
e. Emergency draindown facilities The gates can drain lake (without inflow) in 33 hours if fully opened.

HYDROMETEOROLOGICAL GAGES:

a. Type Staff gage
b. Location Upstream to right of gate house
c. Records Elevations from 1938

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Sixth Lake Dam

NDS ID NO.: NY318 NYS DEC ID NO.: 140-860

ITEM	REMARKS
DRAWINGS	Three design drawings are available, all dated June 1920. 1) Original structure (Plate II) 2) General layout and details (Plate III) 3) Plan, section and details (Plate IV) There are also drawings available of the gate house, gate stand (Plate V), etc.
REGIONAL VICINITY MAP	Dam-lake system is shown on USGS 15-minute quadrangle sheets of N.Y. 1 Old Forge, N.Y. (N4330/W7445) 2 West Canada Lakes, N.Y. (N4430/W7430) 3 Big Moose, N.Y. (N4345/W7445) 4 Raguette Lake, N.Y. (N4345/W7430) Also on HRBRRD map of Black River Area (Plate I)
CONSTRUCTION HISTORY	None available
TYPICAL SECTIONS OF DAM	Shown in design drawings
HYDROLOGIC/HYDRAULIC DATA	No hydraulic data available. Gate opening records from 1938 to present. Rated discharges from Aug. 1968 to present. Flow data available for Watertown, downstream on Black River and for Boonville in same watershed.

ENGINEERING DATA

ITEM	REMARKS
MATERIALS INVESTIGATIONS Boring Records Laboratory Field	None available
POST-CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	None reported
MONITORING SYSTEMS	None reported for dam. Lake elevation is monitored by staff gage to right of gate house.
MODIFICATIONS	None. Present dam replaced original structure in 1920. Small modification done in 1929. Gate wall repaired by placing a block of mass concrete on downstream side of wall (Refer to Appendix E).

ENGINEERING DATA

ITEM	REMARKS
OUTLETS; Plan Details Constraints Discharge Ratings	Plans, details and constraints available from design drawings. Discharge ratings available from August 1968 to present.
RAINFALL/RESERVOIR RECORDS	Reservoir records available; no rainfall records. Runoff rating: 1" = 40 million cubic feet.
DESIGN REPORTS	Picture report on repairs done in 1976 available.
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS: Hydrology & Hydraulics Dam Stability Seepage Studies	Computations dated 1920 available for: 1) Spillway capacity 2) Structural design of spillway structure 3) Overturning stability of spillway section No hydrology computations. No design computations for retaining walls or wing walls. No seepage computations. No sliding stability analysis.

ENGINEERING DATA

ITEM	REMARKS
HIGH POOL RECORDS	Available from HRBRRD
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Picture report of 1948 repairs available from HRBRRD Picture report of 1976 repairs available from HRBRRD
PRIOR ACCIDENTS OR FAILURE OF DAM Description Reports	None
MAINTENANCE AND OPERATION RECORDS	Available from HRBRRD
SPILLWAY: Plan Sections Details	Plans, sections and details available in design drawings

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT: Plans Details	Available from HRBRRD. Refer to Plate V.
PREVIOUS INSPECTION Date; Findings	Inspections are performed periodically by NYSDEC. The latest report filed is for the inspection that was performed on 1 September 1975: "Very good condition. Dam has been reconstructed ..."

APPENDIX B

CHECKLIST - VISUAL DATA

CHECKLIST

VISUAL INSPECTION

PHASE I

NAME OF DAM: Sixth Lake Dam County: Hamilton State: New York NDS ID No.: NY 318

Middle Branch of Moose River NYS DEC ID No.: 140-860

Type of Dam: Earth Embankment Hazard Category: High

Date(s) Inspection: 18 July 1978 Weather: Sunny - Clear Temperature: 72°F

Pool Elevation at Time of Inspection: 1784.5 msl (Gage reading 14.5 = 1784.5 USGS)

Tailwater at Time of Inspection: 1774.7 msl

Inspection Personnel:

E. A. Nowatzki (CWDD)

G. S. Salzman (CWDD)

K. H. Mayhew (HRBRRD)

E. A. Nowatzki Recorder

Remarks:

EMBANKMENT

Sheet 1 of 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None visible	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None visible	
SLOUGHING OR EROSION; Embankment Slopes Abutment Slopes	Embankment slopes: none visible; slight at toe of right wing wall of gate outlet. Abutment slopes: none visible	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	OK	
RIPRAP FAILURES	None. Rocks of old crib above left upstream wing wall of spillway are scattered.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	Abutment: Apparently OK. Spillway: Water seepage on embankment side of left wing wall of spillway at down-stream toe. Also noted possible erosion and spalling of (Refer to Sheet 3)	Recommended trying "wet set" concrete to seal up-stream spall, and possibly stop water seep noticed on downstream side.
ANY NOTICEABLE SEEPAGE	See "JUNCTION OF EMBANKMENT WITH SPILLWAY" above.	
RECORDING INSTRUMENTATION	Staff gage to right of gates (upstream). Read 6 days/week and reported to owner and USGS.	
DRAINS	None indicated or visible.	
OTHER	Low vegetation (tree growth beginning) on upstream slope left of spillway. Moderately wooded downstream slope (trees + brush).	Keep upstream slope trimmed. Cut down small trees.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	left upstream wing wall (steel exposed). Other: Wet soil (swampy, stagnant water) at left downstream toe. Probably natural drainage course; possibly seepage.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Looks OK - slight erosion.	
INTAKE STRUCTURE	Fish screens and trash racks generally OK; rusty below water line. Minor leakage from top of right gate when closed. Reported minor (Refer to Sheet 2)	
OUTLET STRUCTURE	Minor vertical and horizontal cracking and scaling.	
OUTLET CHANNEL	Apron is slightly eroded but seems OK. Right downstream wing wall eroded at toe; could not tell if slight run of water due to seepage or tailwater.	
EMERGENCY GATE	Gates function very well; 20 minutes to lift full. Electrically or manually driven. Right discharge structure appears to have plugged air vent.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
INTAKE STRUCTURE	leakage of both gates in 1968 Repaired. Gates opened 1" at time of inspection. Kept that way to maintain low flow Both gates raised 1" electrically (OK). Right gate closed manually (OK).	
OTHER	Gate house in good physical condition.	

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Generally in good condition; signs of recent patching; some scaling. Concrete chambers under spillway. Signs of moderate seep- (SEE BELOW)	Weep holes reportedly run quite freely when water level is up. Leaks reportedly injection grouted in 1976.
APPROACH CHANNEL	None: concrete apron and left wing wall extend about 10' upstream; look OK. Right wing wall about 3' on upstream side.	
DISCHARGE CHANNEL	Wing walls both sides. Slight erosion of wing wall bases. Generally OK.	
BRIDGE AND PIERS	None.	
CONCRETE WEIR	age in left chamber on upstream and left walls. Signs of recent grouting and patching in both chambers. Weep holes running slowly. Joint patch noted on upstream face.	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Site surveys available in records. Elevation survey across spillway 1976 showed < 1" variation.	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	Staff gage - see "EMBANKMENT - RECORDING INSTRUMENTATION"	Gate opening records available from 1938 to present. Rated discharge records available for gates from August 1968 to present.

RESERVOIR

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Left bank very shallow, < 1 vertical to 20 horizontal. Right bank shallow (5%) for about 100 ft. Then steep rise to about 1 vertical to 2 (SEE BELOW)	
SEDIMENTATION	Appears negligible but hard to tell. No surveys performed.	
OTHER	Reservoir includes 7th Lake (at same elevation). Free between 6th and 7th Lakes under clear bridge.	8th Lake is in watershed but not connected to 6th and 7th Lakes via free access. 8th Lake is higher.
SLOPES	horizontal. Both heavily wooded. Many homes and boat docks on both banks. Seaplane base just upstream of left abutment.	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION Obstructions Debris Other	Obstructions - none visible. Debris - none visible.	
SLOPES Cover Stability	Moderately wooded, heavily vegetated. 3 horizontal to 1 vertical near dam; close to vertical near Route 28. Tree trunks curved - possible mass wasting.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	1 trailer between 6th Lake and 5th Lake downstream of Route 28 crossing. School play-ground and houses at mouth of and along shore of 5th Lake. (SEE BELOW)	
OTHER	Channel crosses Route 28 via 10'x10' box culvert; may restrict maximum flow.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Much downstream of 5th Lake. High hazard.	

APPENDIX C

COMPUTATIONS

By: EAN Date: 4 Aug 1978
Ck: ADD Date: 4 Aug 1978
Subject: Hydraulics of Box Culvert – Sixth Lake Dam

Job # A 7805-11D
Sheet 1 of 1

CONVERSE WARD DAVIS DIXON, INC.
91 ROSELAND AVENUE
P. O. BOX 91
CALDWELL, N. J. 07006

- Culvert dimensions: 10' x 10'
  Culvert length: 70' approximately
  Use entrance loss $K_e = 0.5$
  Use Manning's coef $n = 0.013$
  Use Q = PMF = 2600 cfs
  Refer to BUREC <u>Design of Small Dams</u> p 570

H_T required = 17'

H_T available ≅ 10' → 15'

Therefore box culvert will not pass PMF and Route 28 will probably be overtopped

Box culvert can pass about 2000 cfs under 10 feet of head. This corresponds to about 77% of PMF.

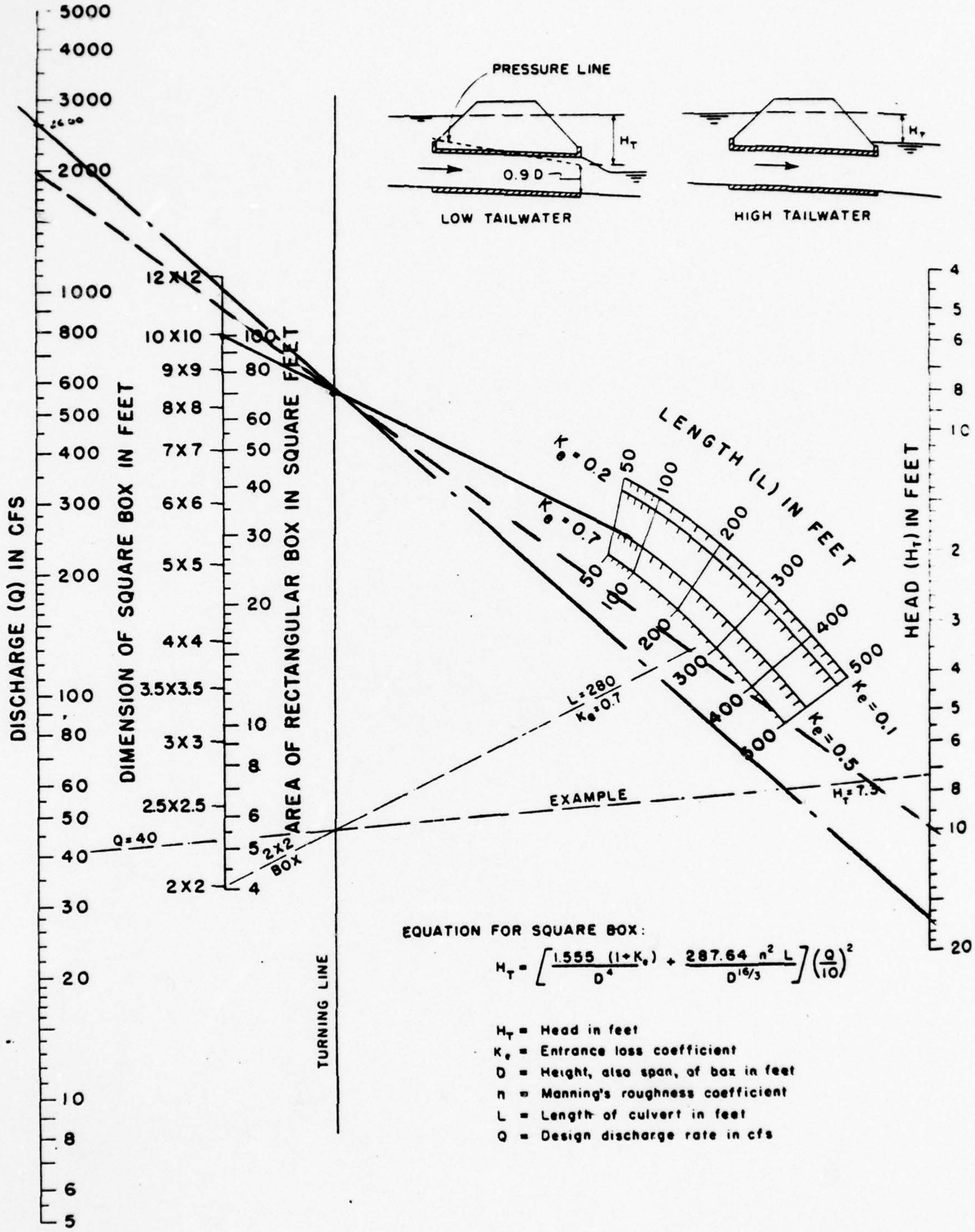


Figure 8–13. Head for concrete box culverts flowing full, n=0.013. (U.S. Bureau of Public Roads.) 288–D–2913.

By: EAN Date: 4 Aug 78
Ck by: ADD Date: 8/4/78
Subject: Hydraulics of gates - Sixth Lake Dam

Job # A7805-11
Sheet 1 of 1

CONVERSE WARD DAVIS DIXON, INC.
91 ROSELAND AVENUE
P. O. BOX 91
CALDWELL, N. J. 07006

Refer to BUREC Design of Small Dams p 467 & p 386

$$Q = \frac{2}{3}\sqrt{2g}\, CL\left(H_1^{3/2} - H_2^{3/2}\right)$$

Elevation of top of dam = 1791 ; Elevation of gate seats = 1775

$\therefore$ $H_1 = 16$
$H_2 = 13$ (gates are 3'x3', i.e. d = 3')
$L = 3'$
$\frac{d}{H_1} = \frac{3}{16} = 0.1875$

$\therefore$ $C \doteq 0.70$ from Fig 257 in BUREC p. 386

$$Q = \frac{2}{3}\sqrt{64.4} \times 0.7 \times 3 \times \left(16^{3/2} - 13^{3/2}\right)$$

$$Q = 2 \times 8.02 \times 0.7 \times 1 \times 17.13 = 192^{+} \text{ cfs}$$

There are 2 gates therefore

Q_T (gates) $\doteq$ 385 cfs

There are gate calibration data available, however. Take flow of 13 May 1971.

$$\begin{array}{r} 1786 \\ \underline{1775} \\ H_1 = 11 \end{array}$$

$H_2 = 11 - 2.5 = 8.5$
$d/H_1 = 2.5/11 = 0.23$ therefore $C \cong 0.695$

$$Q = \frac{2}{3}\sqrt{64.4} \times 0.695 \times 3 \times \left(11^{3/2} - 8.5^{3/2}\right)$$

$$Q = 2 \times 8.02 \times 0.695 \times 1 \times 11.70 = 130 \text{ cfs}$$

Q_T (gates) = 260 cfs > 222

$\therefore$ Adjust C from field results
$C \doteq 0.60$

$\therefore$ When gates are full open

$$Q_T = 2\left[192\left(\frac{0.6}{0.7}\right)\right] \cong 329 \text{ cfs.}$$

Gage readings at 8:00 a.m.
unless otherwise noted

SIXTH LAKE RESERVOIR

Date	Gate Opening No. 1	Gate Opening No. 2	Reservoir Stage	Discharge cfs.	Time
1971					
April					
1	36"	36"	3:30	70	
2	36	36	3:40	70	
3	36	36	3:40	70	
4					
5	36	36	3:30	70	
6	36	36	3:25	70	
7	36	36	3.10 1778:70	70	Changed to USGS datum
8	36	36	3.05 78:65	55	*
9	36	36	3.05 78:65	55	
10	36	36	78:65	55	
11					
12	36	36	78:90	56	
13	36	36	79:00	58	
14	36	36	79:30	84	At 2/3 flow
15	36	36	79:60	88	At 2/3 flow
16	36	36	79:70	90	At 2/3 flow
17	36	36	79:65	88	At 2/3 flow
18					
19	36	36	79:60	88	At 2/3 flow
20	36	36	79:90	138	Full flow
21	2	2	80:20	14	
22	2	2	80:50	14	
23	2	2	80:80	15	
24	2	2	81:00	15	
25					
26	2	2	81:30	16	
27	2	2	81:50	16	
28	2	2	81:55	16	
29	2	2	81:75	16	
30	2	2	81:95	16	
May					
1	2	2	82:20	16	
2					
3	2	2	83:25	18	
4	2	2	83:80	18	
5	2	2	84:15	18	
6	12	12	84:40	93	
7	12	12	84:70	94	
8	12	12	84:90	96	
9	18	18	85:10	143	1 PM
10	18	18	65:50	146	
11	30	30	85:75	220	
12	30	30	85:80	220	
13	30	30	85:90	222	
14	30	30	85:80	220	

* Estimated flow through obstructed racks

BGM 7/31/78

CHECKED ADD 8/3/78

HYDROLOGY

A 7805-11D

DETERMINATION OF PEAK INFLOWS

SIXTH LAKE DAM, N.Y.

CONVERSE WARD DAVIS DIXON, INC.
91 ROSELAND AVENUE
P. O. BOX 91
CALDWELL, N. J. 07006

1. DETERMINE Q_{max} WHEN H_2O IS AT TOP OF DAM.

FROM STABILITY CALC. Q = 1096 cfs. < PMF OR SPF

∴ PROCEED WITH INFLOW CALCULATIONS USING SUBBASIN # 38 AS COMPARATIVE MODEL.

SUBBASIN # 38 = A_1 = DRAINAGE AREA = 67 sq mi. (FROM UPPER HUDSON & MOHAWK RIVER BASINS) A.C.O.E. p123 TABLE 6.20

SPF_1 = 15374 (U.H.R. TABLE 6.26, P. 130)

SIXTH LAKE SUBBASIN = A_2 = 17 sq mi. (FROM HUDSON RIVER - BLACK RIVER REGULATING DISTRICT)

$$\left(\frac{A_1}{A_2}\right)^{.75} = \frac{SPF_1}{SPF_2} \text{ OR } \frac{PMF_1}{PMF_2}$$

$$\left(\frac{67}{17}\right)^{.75} = \frac{15374}{SPF_2}$$

$$SPF_2 = \frac{15374}{2.80} = 5496$$

SPF FOR SIXTH LAKE DAM

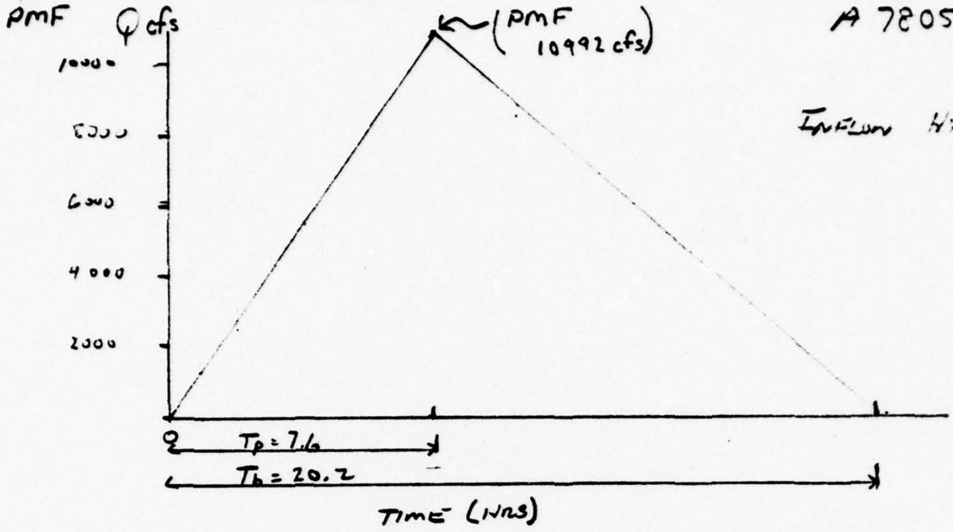
5496 cfs.

(PMF = 2SPF = 10992 cfs)

· USE PMF FOR SDF as per OCE guidelines

SIXTH LAKE DAM

INFLOW HYDROGRAPH



SOLVE FOR T_p - ASSUME T_p IS A FUNCTION OF THE LINEAR ELEMENTS OF EQUIVALENT AREAS.

$A_1 = 67$ sq. mi. $= \frac{\pi}{4} d_1^{2}$ * $\quad T_{p_1} = 15$ hrs **

* FROM UHR P123
** FROM UHR P124

$d_1 = 9.24$

$A_2 = 17 = \frac{\pi}{4} d_2^2 \qquad T_{p_2} = ?$

$d_2 = 4.65$

$$T_{p_2} = \frac{d_2}{d_1} T_{p_1}$$

$$= \frac{4.65}{9.24}(15) = 7.6$$

$$T_b = 2.67(T_{p_2}) = 20.2$$

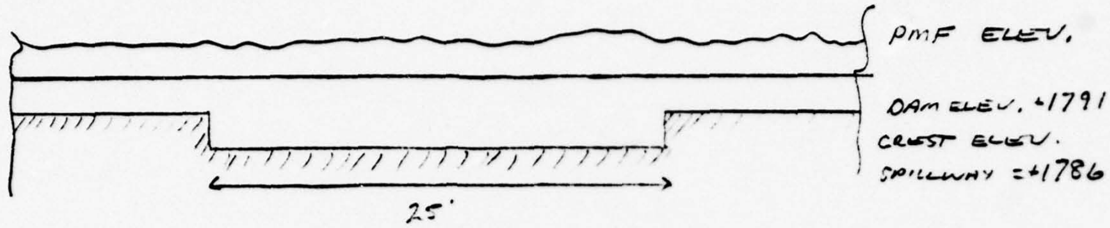
CONVERSE WARD DAVIS DIXON, INC.
91 ROSELAND AVENUE
P. O. BOX 91
CALDWELL, N. J. 07006

RGM 7/31/78

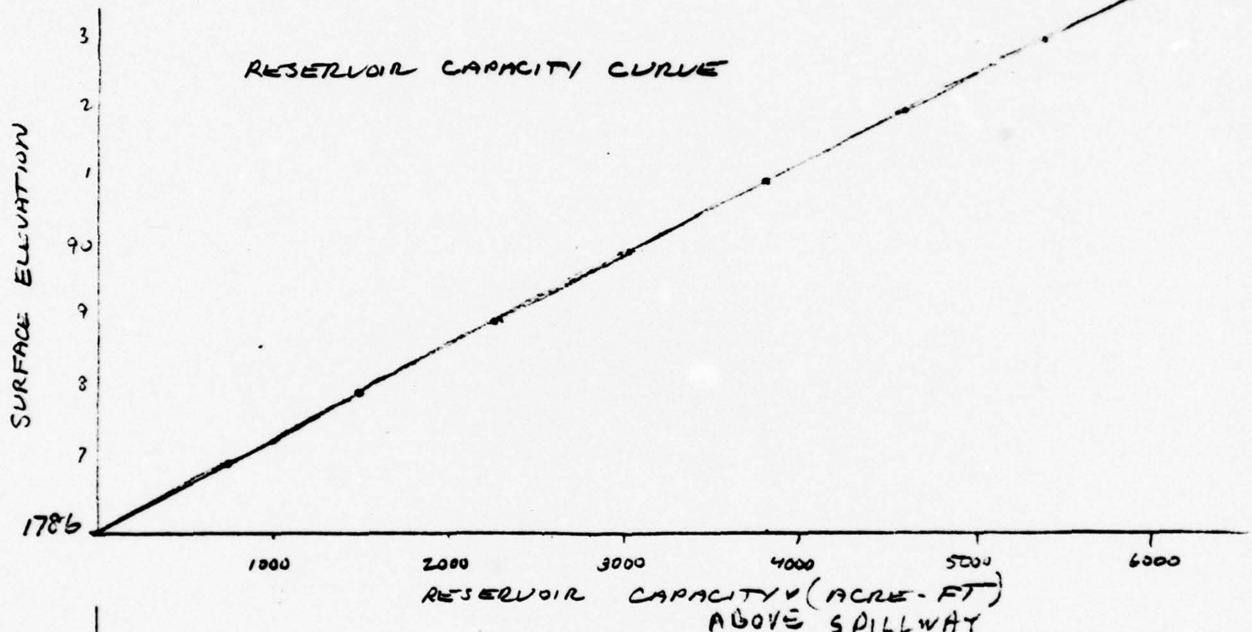
CHECKED 8/3/78 ADD

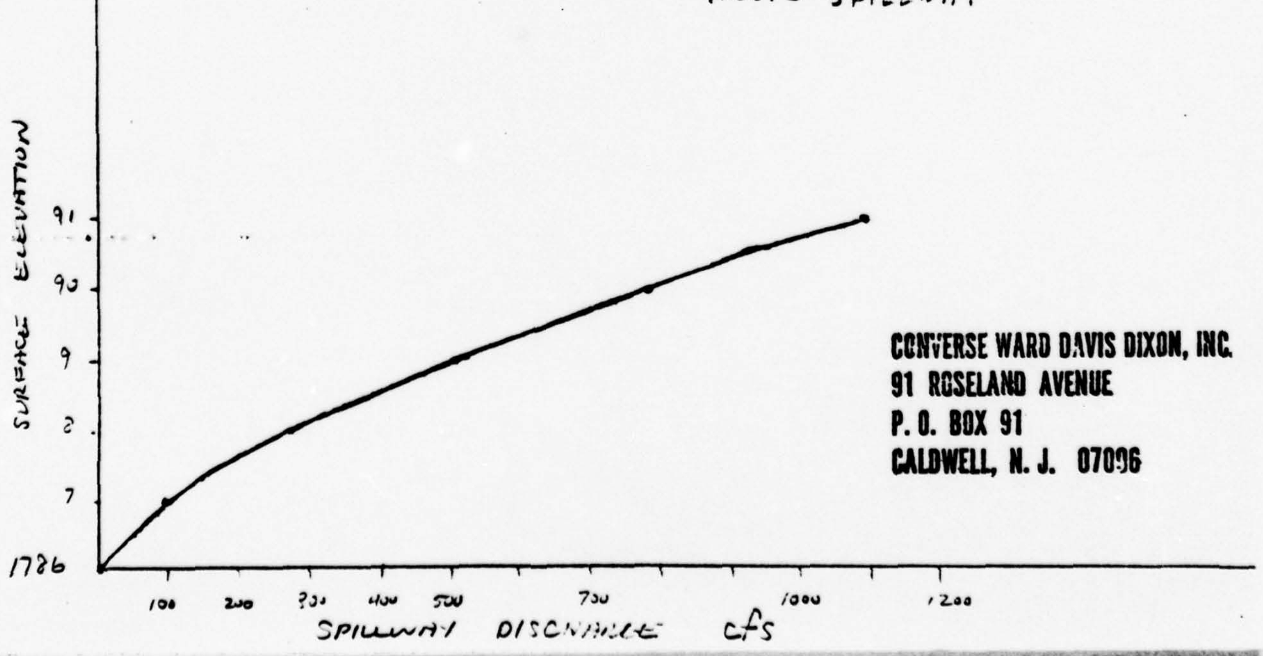
A7805-11D

HYDROLOGY - FLOOD ROUTING - SIXTH LAKE DAM



THE FOLLOWING FLOOD ROUTING WILL BE USED TO DETERMINE POOL ELEVATION AT PMF.





CONVERSE WARD DAVIS DIXON, INC.
91 ROSELAND AVENUE
P. O. BOX 91
CALDWELL, N. J. 07006

HYDROLOGY - FLOOD ROUTING - SIXTY LAKE DAM

FLOOD STORAGE VS. SURFACE ELEVATION

LAKE AREA @ POOL ELEV. = 735 ACRES (FROM HUDSON R. - BLACK R. REGULATING DIST.)

USE 1:9 SLOPE ON SHORE. FROM U.S.G.S. QUAD MAPS

FOR ELEV.

$He \rightarrow \Delta VOL = He\,(\text{LAKE AREA}) + \frac{He\,(\text{SLOPE} \times He)}{2} \times \text{LENGTH OF SHORE} \times \frac{5280\ ft}{1\ mi} \times \frac{1\ ac}{43560}$ (USE 9.5 FROM)

ASSUME 1:9 AVE. SLOPE ON SHORE FROM U.S.G.S. QUAD MAPS

1.0' $= 1(735) + \frac{1(9 \times 1)}{2}(9.5) \times \frac{5280}{43560}$

740 = 735 + 5.2

2.0' $= 2(735) + \frac{2(9)2}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

1491 = 1470 + 20.7

3.0' $= 3(735) + \frac{3(9)3}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

2252 = 2205 + 46.6

4.0' $= 4(735) + \frac{4(9)4}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

3023 = 2940 + 82.9

5.0' $= 5(735) + \frac{5(9)5}{2}\left(\frac{9.5 - 5280}{43560}\right)$

3805 = 3675 + 129.5

6.0' $= 6(735) + \frac{6(9)6}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

4597 = 4410 + 186.5

7.0 $= 7(735) + \frac{7(9)7}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

5399 = 5145 + 253.9

8.0 $= 8(735)\ \frac{8(9)8}{2}\left(\frac{9.5 \times 5280}{43560}\right)$

6212 = 5880 + 331.6

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BY PSM 8/1/78
CHECKED RJD 8/3/78

HYDROLOGY - FLOOD ROUTING - SIXTY LAKE DAM

DISCHARGE OVER SPILLWAY (cfs)

$$Q = C_0 L H_e^{3/2}$$

L = 25'
C = 3.95(.995) DESIGN OF SMALL DAMS P226-277

H_e (ELEV)

1.0'	=	$3.93(25')(1)^{3/2}$
	=	98 cfs
2.0	=	$3.93(25)\ 2^{3/2}$
	=	278 cfs
3.0	=	$3.93(25)\ 3^{3/2}$
	=	511 cfs
4.0	=	$3.93(25)\ 4^{3/2}$
	=	786 cfs
5.0	=	$3.92(25)\ 5^{3/2}$
	=	1096 cfs

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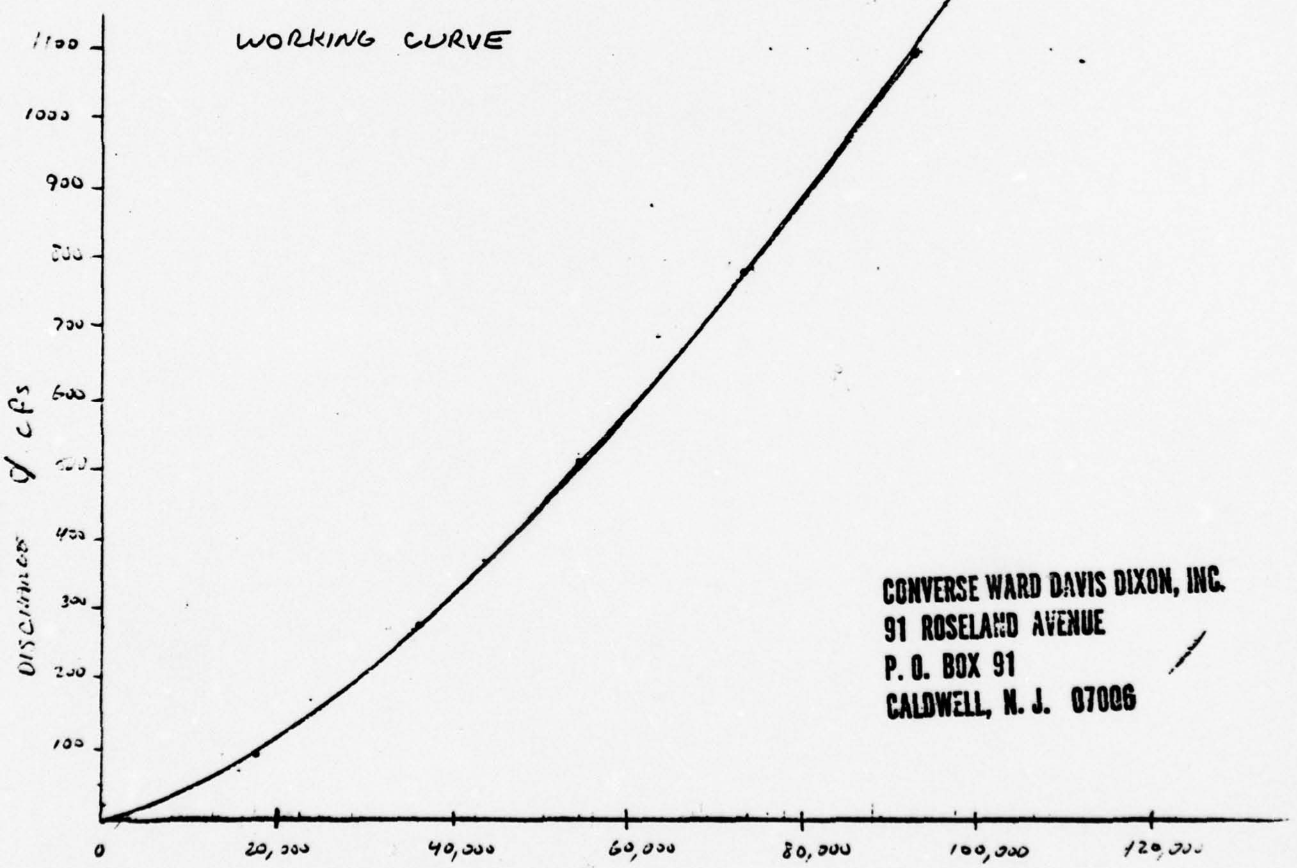
HYDROLOGY – FLOOD ROUTING – SIXTH LAKE DAM

WORKING CURVES

ELEV. (ft)	$\emptyset$ cfs	$\emptyset/2$ (cfs)	FLOOD STOR. (acre-ft)	FLOOD STOR. cfs-hrs	$S/\Delta T$ (0.5hr)	$SI = \frac{\emptyset}{2} + \frac{S}{\Delta T}$
POOL 0	6	0	0	0	0	0
1	98	49	740	8954	17908	17957
2	278	139	1491	18041	36082	36221
3	511	256	2252	27249	54498	54754
4	786	393	3023	36578	73156	73549
5	1096	548	3805	46041	92082	92630



$SI = \frac{\emptyset}{2} + S/\Delta T$ (COL 7)

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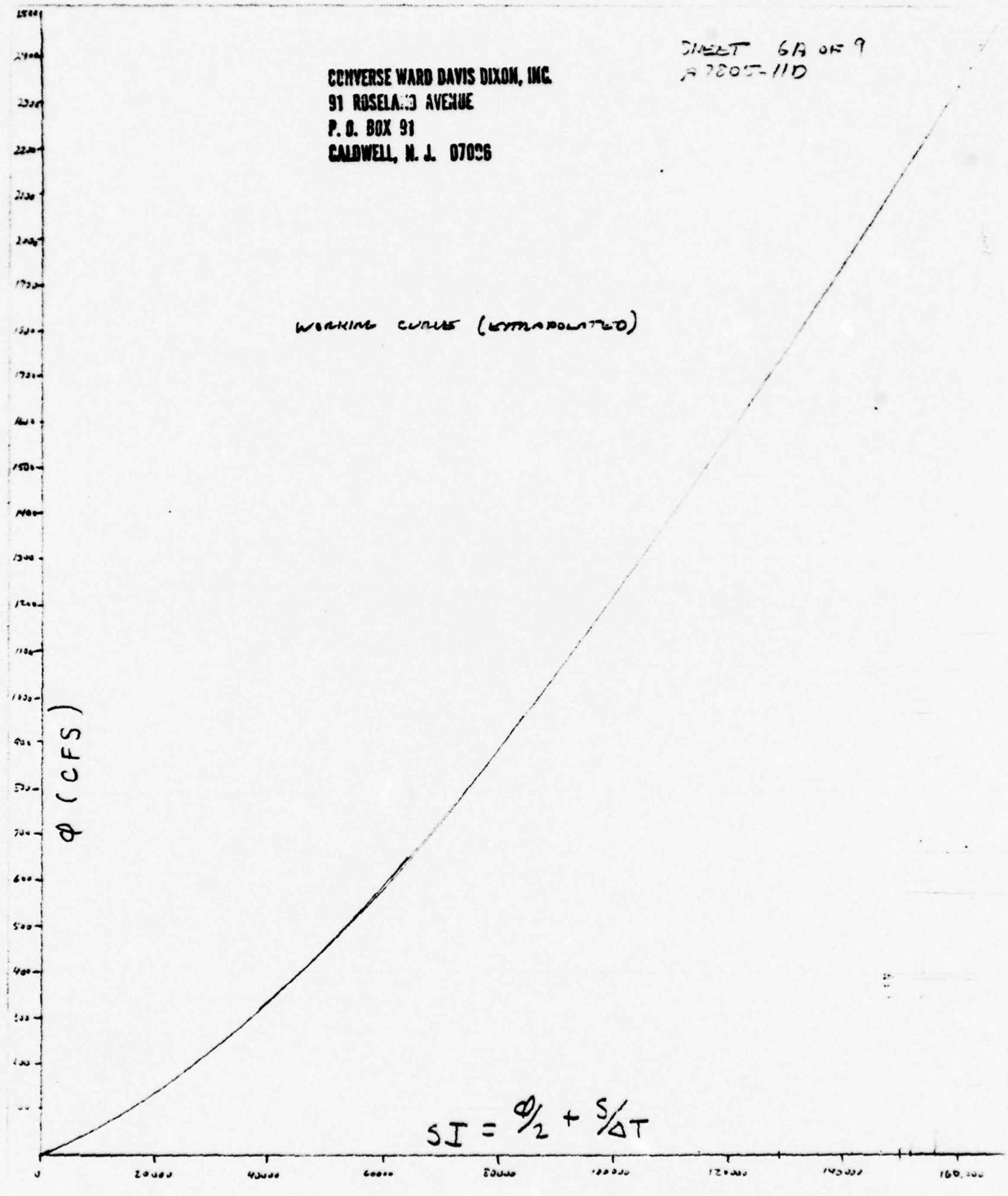

(1) TIME (HRS) (ΔT=0.5)	(2) I cfs	(3) $\bar{I}_N$ cfs	(4) SI_N	(5) $\emptyset_N$	(6) $SI_{N+1} = SI_N - \emptyset_N + \bar{I}_{N+1}$
0	0	0	0	0	$0^{(4)} - 0^{(5)} + 725^{(3)} = 725^{(6)}$
1	1450	725	725	0	725 - 0 + 2150 = 2875
2	2850	2150	2875	10	2875 - 10 + 3575 = 6440
3	4300	3575	6440	25	6440 - 25 + 5025 = 11440
4	5750	5025	11440	55	11440 - 55 + 6500 = 17885
5	7250	6500	17885	95	17885 - 95 + 7925 = 25715
6	8600	7925	25715	165	25715 - 165 + 9350 = 34900
7	10100	9350	34900	265	34900 - 265 + 10400 = 45035
8	10700	10400	45035	380	45035 - 380 + 10250 = 54905
9	9800	10250	54905	525	54905 - 525 + 9350 = 63730
10	8900	9350	63730	640	63730 - 640 + 8450 = 71540
11	8000	8450	71540	750	71540 - 750 + 7600 = 78390
12	7200	7600	78390	860	78390 - 860 + 6750 = 84280
13	6300	6750	84280	960	84280 - 960 + 5850 = 89170
14	5400	5850	89170	1040	89170 - 1040 + 4975 = 93105
15	4550	4975	93105	1120	93105 - 1120 + 4100 = 96085
16	3650	4100	96085	1160	96085 - 1160 + 3225 = 98150
17	2800	3225	98150	1200	98150 - 1200 + 2350 = 99300
18	1900	2350	99300	1225	99300 - 1225 + 1450 = 99525
19	1000	1450	99525	1225	99525 - 1225 + 575 = 98875
20	150	575	98875	1220	98875 - 1220 + 75 = 97730
21	0	75	97730	1180	

NOTE: NOT ACCURATE BY A FACTOR OF 2 TOO SMALL
TIME INTERVALS 1 HR.
USED ΔT AS 0.5 HRS.

PEAK OUTFLOW Ø SHOULD BE 2X 1225 ≅ 2450 cfs

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ADD 8/3/78 SHEET 7A of 9

CHECKED BY: PGM 8/3/78 A7805-11D

(1) Time ΔT: 0.5 Hrs	(2) I cfs	(3) $\bar{I}_N$ cfs	(4) SI_N	(5) ϕ_N	$SI_{N+1} = SI_N - \phi_N + \bar{I}_{N+1}$
0	0	0	0	0	0 - 0 + 350 = 350
0.5	700	350	350	0	350 - 0 + 1075 = 1425
1	1450	1075	1425	5	1425 - 5 + 1825 = 3245
1.5	2200	1825	3245	15	3245 - 15 + 2525 = 5755
2	2850	2525	5755	25	5755 - 25 + 3225 = 8955
2.5	3600	3225	8955	40	8955 - 40 + 3950 = 12865
3	4300	3950	12865	60	12865 - 60 + 4663 = 17468
3.5	5025	4663	17468	90	17468 - 90 + 5388 = 22766
4	5750	5388	22766	140	22766 - 140 + 6113 = 28739
4.5	6475	6113	28739	200	28739 - 200 + 6863 = 35402
5	7250	6863	35402	275	35402 - 275 + 7575 = 42702
5.5	7900	7575	42702	350	42702 - 350 + 8250 = 50602
6	8600	8250	50602	450	50602 - 450 + 8975 = 5912
6.5	9350	8975	59127	570	59127 - 570 + 9725 = 6828
7	10100	9725	68282	710	68282 - 710 + 10450 = 7802
7.5	10800	10450	78022	860	78022 - 860 + 10750 = 8791
8	10700	10750	87912	1025	87912 - 1025 + 10450 = 9733
8.5	10200	10450	97337	1190	97337 - 1190 + 10000 = 1061
9	9800	10000	106147	1350	106147 - 1350 + 9575 = 11437
9.5	9350	9575	114372	1475	114372 - 1475 + 9125 = 12202
10	8900	9125	122022	1615	122022 - 1615 + 8675 = 12908
10.5	8450	8675	129082	1745	129082 - 1745 + 8225 = 13556
11	8000	8225	135562	1875	135542 - 1875 + 7788 = 14145
11.5	7575	7788	141475	1985	141455 - 1985 + 7388 = 146858
12	7200	7388	146878	2085	146858 - 2085 + 6978 = 15175
12.5	6750	6975	151768	2185	151751 - 2185 + 6525 = 156091
13	6300	6525	156108	2250	156091 - 2250 + 6050 = 159891
13.5	5800	6050	159908	2340	159891 - 2340 + 5600 = 163151
14	5400	5600	163168	2410	163151 - 2410 + 5175 = 16591
14.5	4950	5175	165933	2435	165916 - 2435 + 4750 = 16823
15	4550	4750	168248	2510	168231 - 2510 + 4313 = 17003
15.5	4075	4313	170051	2545	170034 - 2545 + 3863 = 17135
16	3650	3863	171369	2565	171352 - 2565 + 3438 = 17222
16.5	3225	3438	172242	2575	172225 - 2575 + 3013 = 172663
17	2800	3013	172680	2600	172663 - 2600 + 2575 = 172638
17.5	2350	2575	172655	2600	172638 - 2600 + 2125 = 172163
18	1900	2125	172180	2575	172163 - 2575 + 1675 = 171263
18.5	1450	1675	171280	2565	171263 - 2565 + 1225 = 169923
19	1000	1225	169940	2545	169923 - 2545 + 775 = 168153
19.5	550	775	168170	2510	168153 - 2510 + 350 = 1659
20	150	350	166010	2435	165993 - 2435 + 75 = 163633
20.5	0	75	163675	2410	163633 - 2410 + 0 = 161223
21	0	0	161265	2355	161223 - 2355 + 0 = 158868

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DD 8/3/78 Sheet 8 of 9

ck: PGm 8/3/78 Hydrology - Flood Routing - Sixth Lake Dam A7805-11D

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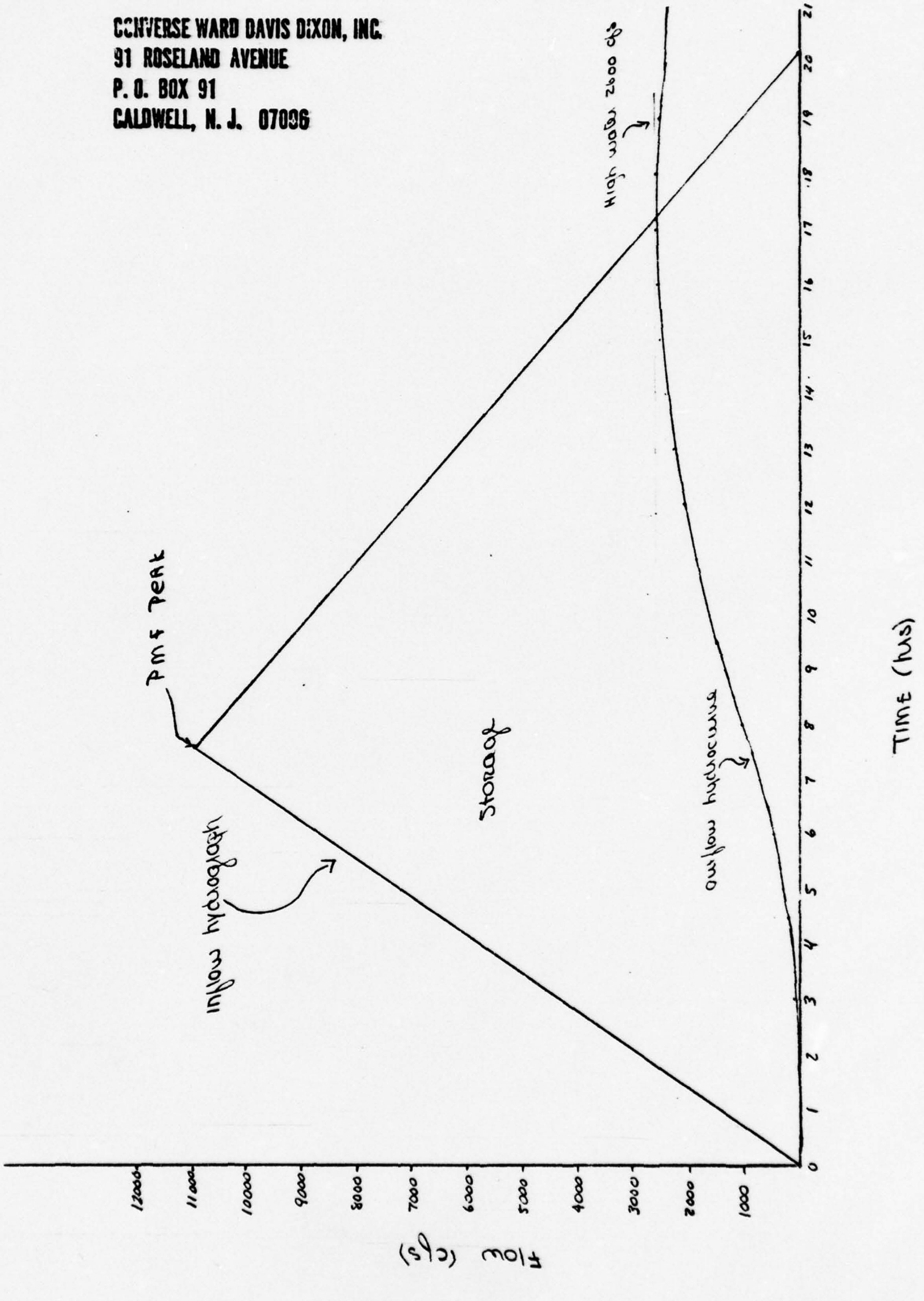

HYDROLOGY - FLOOD ROUTING - SIXTH LAKE DAM

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$Q_{MAX} = 2600$ cfs.

FIND H_c OVER SPILLWAY

$$Q = cLH^{3/2}$$

$$2600 = 3.92(25)H^{3/2}$$

$$H = \left(\frac{2600}{3.92(25)}\right)^{2/3} = 8.9 \text{ ft.}$$

∴ THE PMF WILL RAISE THE POOL 8.9' TO ELEV. +1786 + 8.9 = $\boxed{+1794.9'}$

OR 3.8' ABOVE HEIGHT OF SPILLWAY WHICH WILL OVERTOP THE DAM.

THE MAX. DISCHARGE THROUGH THE SPILLWAY w/ H_2O LEVEL AT DAM CREST (5' ABOVE SPILLWAY) IS 1096 cfs SAY 1100 cfs

PEAK Q = 2600 cfs.

% OF PMF THAT CAN BE PASSED IS $\frac{1100}{2600} \times 100 = 42\%$

1) Stability Against overturning:

Checked calculations in the original file. Resultant falls almost at the center of the base. Although no uplift forces considered, the resultant should be still in the middle third even if uplift forces are taken into account.

2) Stability Against sliding

Considering the stability of central 12.5 ft. of the dam length that includes the buttress; assuming no support from continuity and retaining walls.

Horizontal water thrust and resisting weights have already been calculated in the original file for 13' of water over the crest of the dam.

H = 159 349 lb. for 12.5 ft. length of dam

Buttress weight = 29 200 lb.
Deck, Crest and apron weight = 64 000 lb.
Water load = 168,600 lb.

ΣW = 261 800 lb. ✓

The foundation material is not known with certainty. Geology report presumes a thick soil deposit. Hence it is assumed that dam rests on soil with sliding friction coefficient of $\mu = 0.3$

$$\therefore \text{F.S. against sliding} = \frac{0.3 \times 261800}{159348} = 0.49.$$

The dam is, therefore, not safe against sliding for the assumed conditions. However, the spillway cannot take more than 5' of water over the crest, otherwise the earthen dam will be overtopped and fail due to

erosion.. More realistically taking total head of water = 11+5 = 16 ft.

Horizontal Water Thrust $= \frac{62.4}{2}\left[(16)^2-(5)^2\right]\times 12.5 = 90090$

Vertical water load for 16 ft. of water

$= 62.4\left[(5\times 13.5\times 12.5)+(\frac{1}{2}\times 13.5\times 11\times 12.5)\right] = 110565$ ✓

$\therefore \Sigma W = 29200 + 64000 + 110565 = 203765$ lb. ✓

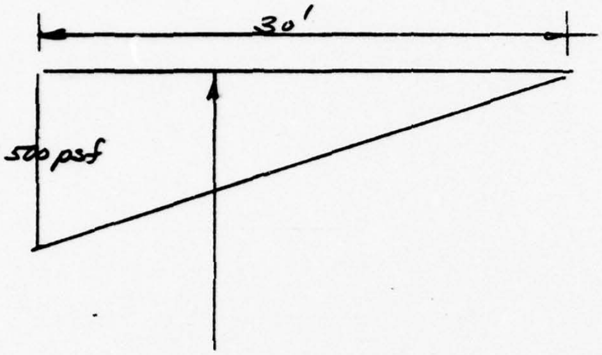
$\therefore F.S. = \frac{0.3\times 203765}{90090} = 0.68$ ✓

The cutoff wall effect at the upstream and downstream ends of the spillway bring up the F.S. against sliding to 1.7 as demonstrated on sheet 4.

By: EAN Date 8/7/78 Sheet 3 of 4
CKD BY: PBM Date 8/9/78 Job # A7805-11D
Subject: Sliding Stability - Sixth Lake Dam NY
Taking uplift into consideration

Because cutoff wall tends to reduce uplift pressure on base, assume one half of hydrostatic head acts at upstream end of base slab and that distribution is triangular.

$p = \frac{62.4 \times 16}{2} \cong 500$ psf



$U = \frac{1}{2}(500)(30) = 7500$ #/ft $\times 12.5' = 93750$ #

FS against sliding accounting for uplift $= \frac{0.3\,(203765 - 93750)}{90090} = 0.37$

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BY: EAN DATE: 8/15/78
Ck'd BY J.K. DATE: 8/16/78
Subject: Sliding stability – Sixth Lake Dam

Sheet 4 of 4
Job # A7885-11D

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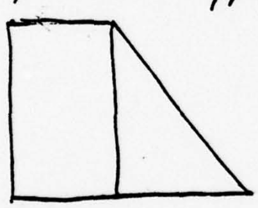
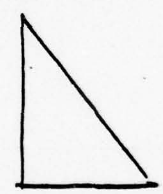
Assume 5' of water over spillway
Base width = 30' ; spillway width = 12.5 ft ; spillway section considered = 12.5 ft
Buttress weight = 29200 lbs
Deck, crest & apron weight = 64000 lbs
Water load (assume to be
62.4 pcf × 5 ft × 13.5 ft × 12.5 ft = 52650 lbs
+ ½ 13.5 ft × 11 ft × 12.5 ft × 62.4 pcf) = 57915
Σ W = 203765 lbs = 16301 #/ft

Unit stress = $\frac{203765 \text{ lbs}}{12.5\text{ft} \times 30\text{ft}} \doteq 543$ psf

Compute passive resistance due to heel and toe cut off walls.
Assume cutoff walls extend 4.5 feet below base of slab.
Comps. for overturning indicate resultant of forces falls almost at center of base for 13' of water over spillway – assume same for 5' over spillway ∴ assume uniform distribution of stress.
Assume ½ uplift : U = 7500 #/ft
Assume uniformly distributed = 7500 #/ft / 30 ft = 250 psf

Assume $K_p = 3.5$

Upstream cutoff pres. distrib. 

Downstream cutoff pres. distr. 

$P_{PU} = (543 - 250)\frac{\#}{ft^2} \times 4.5ft \times 3.5 \times 12.5ft$

$+ \frac{1}{2}\left(70\frac{\#}{ft^3}\right)(4.5ft^2)^2 \times 12.5 ft \times 3.5$

$P_{PD} = 31008$

$P_{PU} = \cancel{57752}\ 57684\ \# + 31008\ \# = \cancel{88760}\ 88692\ \#$

$\therefore P_p\ (\text{total}) = \cancel{119774}\ 119700$

This is conservative since design drawings show that spillway is structurally part of base slab that underlies entire spillway / gate house structure & retaining walls

$\therefore FS\ (\text{sliding}) = \frac{0.3\,(\cancel{16301}\ 203765 - \cancel{7500}\ 93750) + \cancel{119774}\ 119700}{90090} = \frac{\cancel{2640}\ 33005 + \cancel{119774}\ 119700}{90090} = \cancel{1.4}\ 1.7$

APPENDIX D

PHOTOGRAPHS

FIGURE 1. DOWNSTREAM VIEW OF SPILLWAY GATE HOUSE STRUCTURE

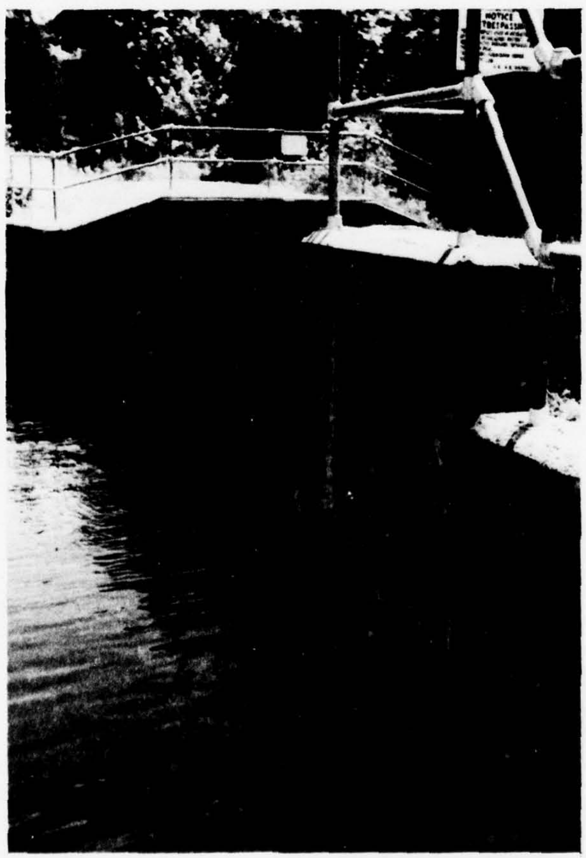


FIGURE 2. STAFF GAGE

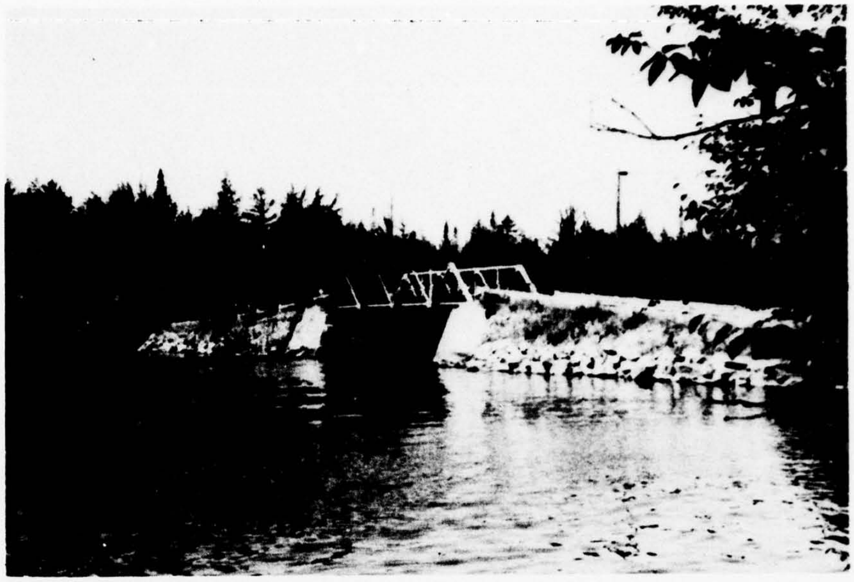


FIGURE 3. JUNCTION OF SIXTH AND SEVENTH LAKES

FIGURE 4. LEFT EMBANKMENT CREST

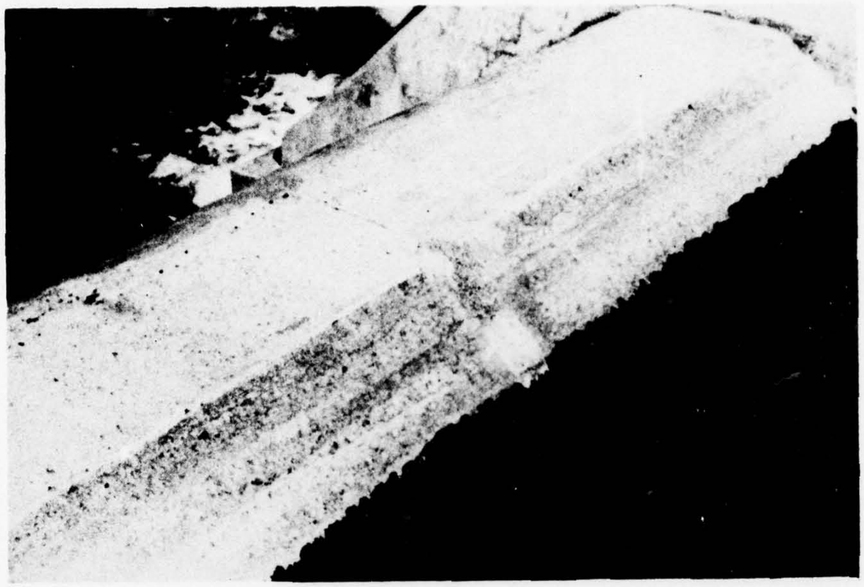


FIGURE 5. SPILLWAY CREST - PATCHED JOINT

FIGURE 6. SEEPAGE BETWEEN LEFT DOWNSTREAM EMBANKMENT AND SPILLWAY RETAINING WALL

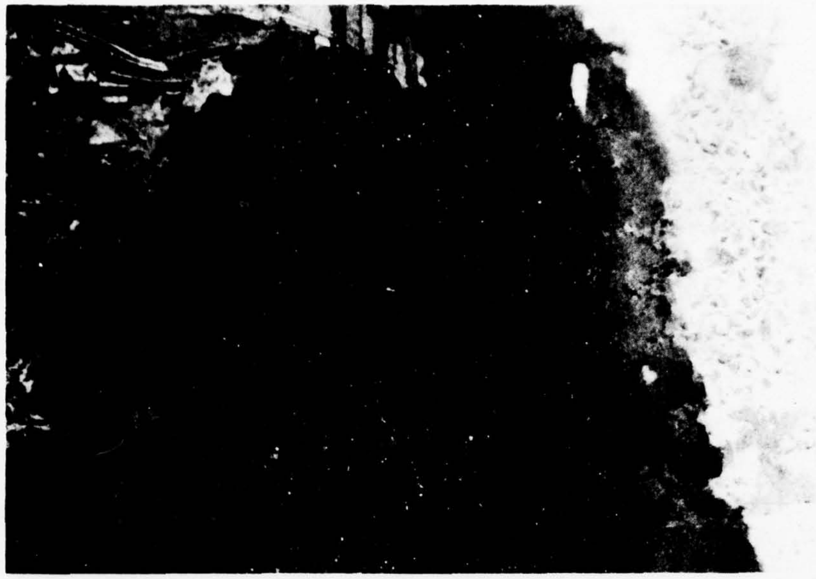


FIGURE 7. SEEPAGE THROUGH LEFT SIDE SPILLWAY RETAINING WALL (LEFT COMPARTMENT)

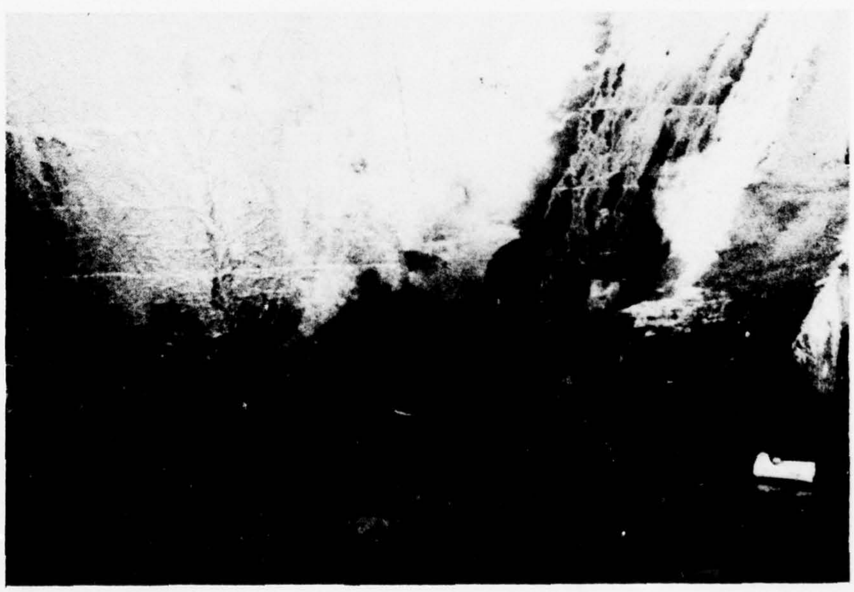


FIGURE 8. SEEPAGE NEAR UPSTREAM JUNCTION OF SPILLWAY SECTION AND BASE SLAB (LEFT COMPARTMENT)

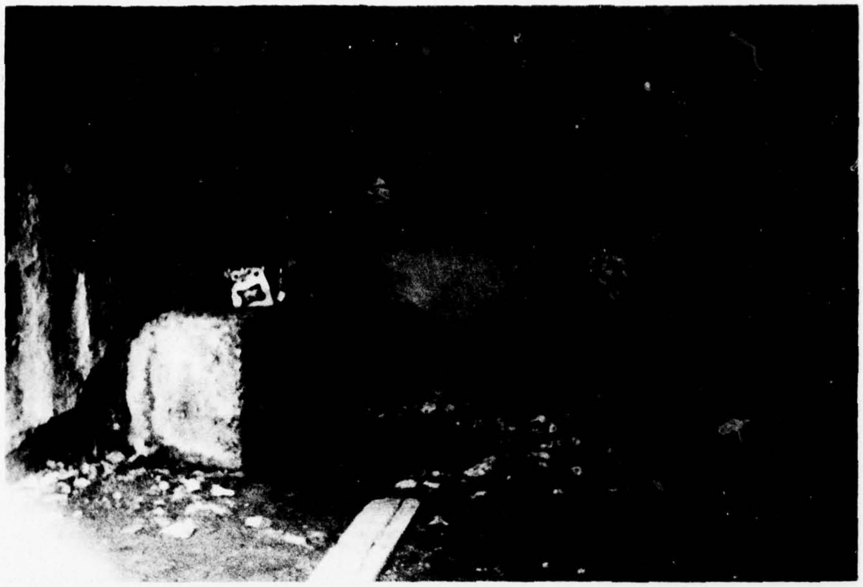


FIGURE 9. SEEPAGE AND CONCRETE DETERIORATION (RIGHT COMPARTMENT)

FIGURE 10. GATE HOUSE SUBSTRUCTURE AND GATE PORTALS

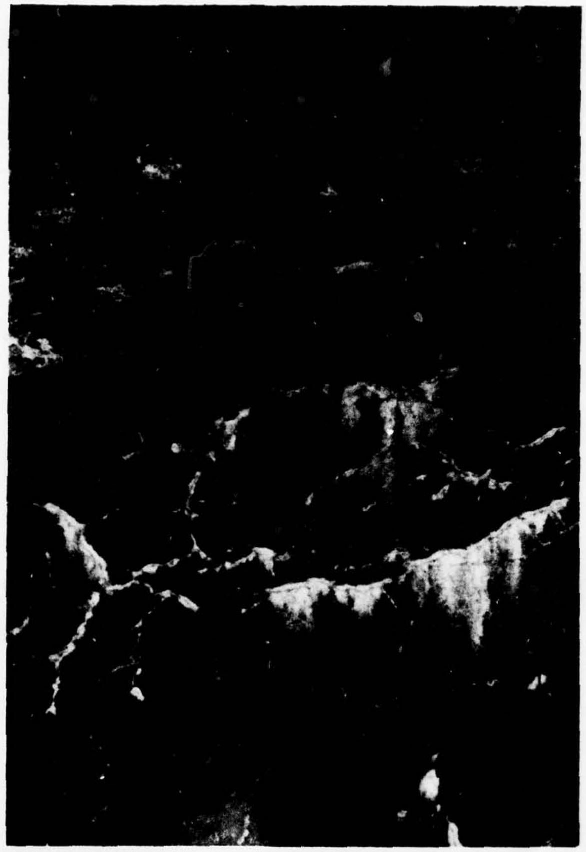


FIGURE 11. CRACKING AND SCALING OF MASSIVE CONCRETE BUTTRESS

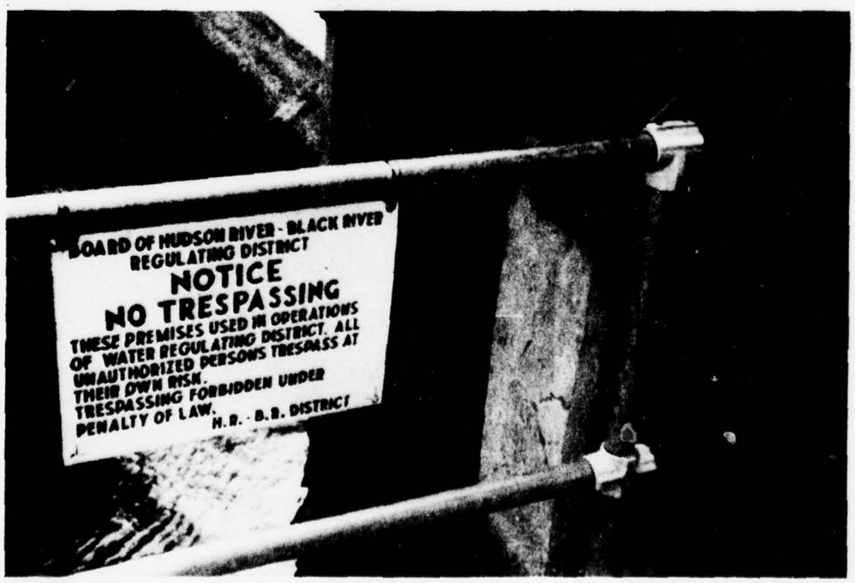


FIGURE 12. GUARD RAIL AND SIGN AT GATE HOUSE

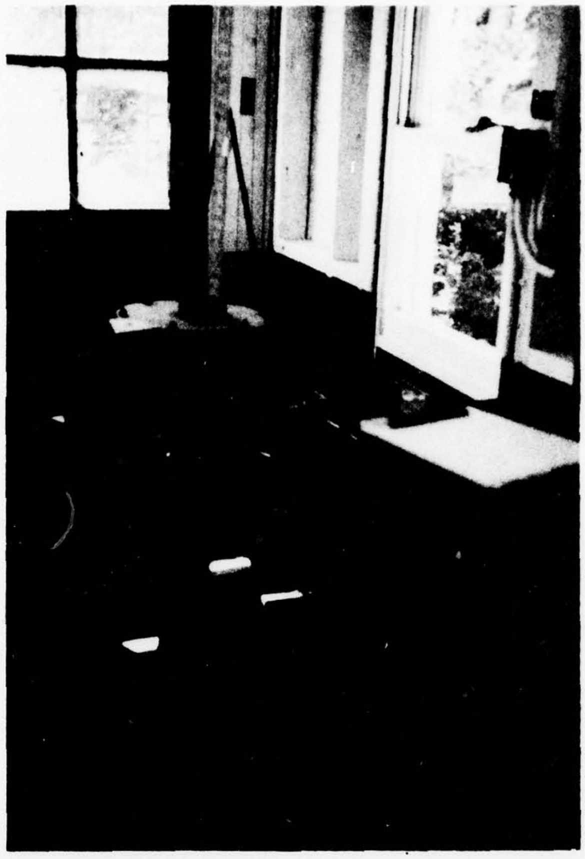


FIGURE 13. GATE CONTROL FOR SOUTH GATE

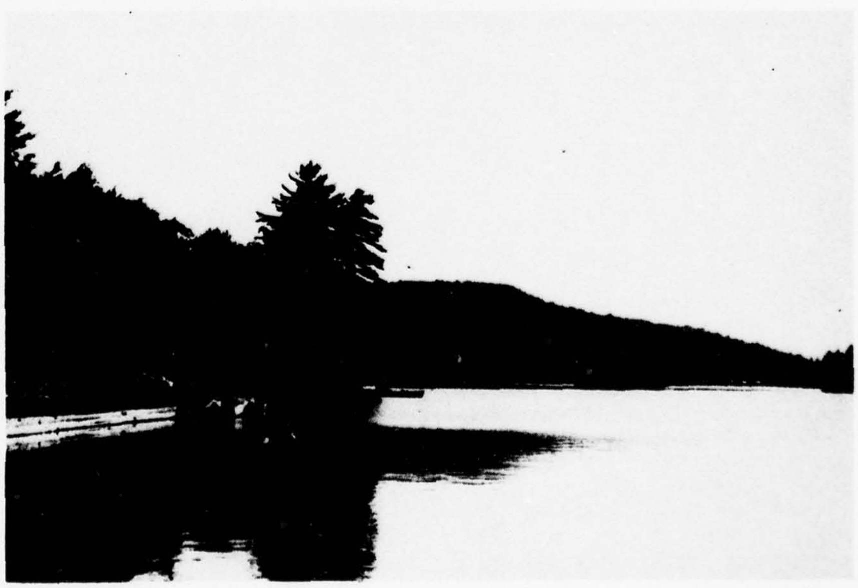


FIGURE 14. RESERVOIR AREA - RIGHT SHORELINE

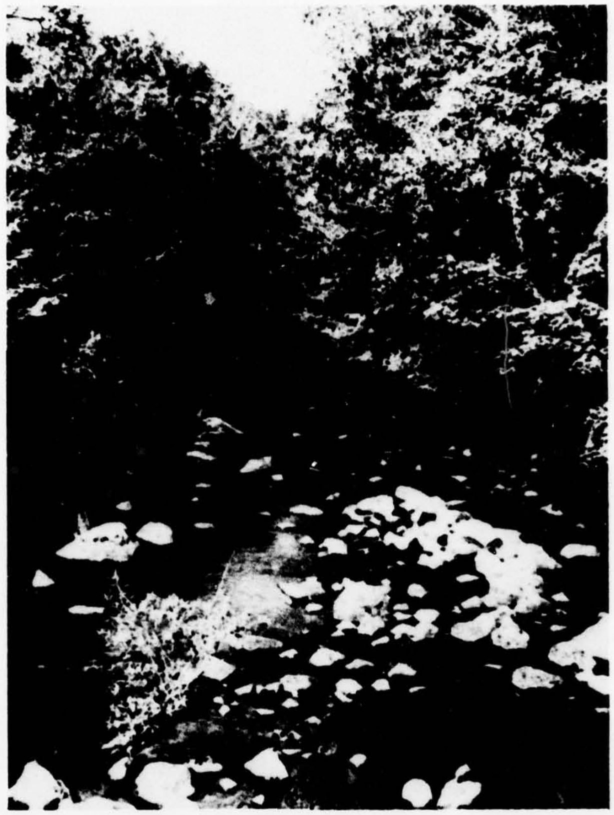


FIGURE 15. NATURAL CHANNEL IMMEDIATELY DOWNSTREAM OF DAM

FIGURE 16. BOX CULVERT DOWNSTREAM UNDER STATE ROUTE 28

APPENDIX E

RELATED DOCUMENTS

AD-A073 166 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/2
NATIONAL DAM SAFETY PROGRAM. SIXTH LAKE DAM (NDS NUMBER NY-318,--ETC(U)
SEP 78 E A NOWATZKI, G S SALZMAN DACW51-78-C-0035

UNCLASSIFIED NL

2 OF 2

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A073166

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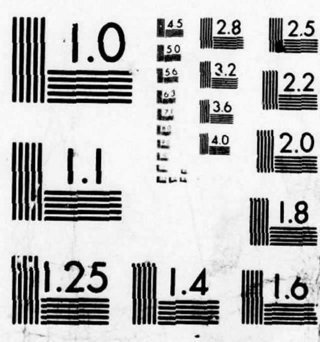


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

DIVISION OF ENGINEERING

ALBANY

Received Nov. 12, 1929 Dam No. 140-860

Disposition Approved Watershed Black River

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see last page of this application) for the approval of specifications and detailed drawings, marked "File MY-3.47 Acc. 7252

herewith submitted for the { repair ~~construction~~ reconstruction } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about November, 1929
(Date)

1. The dam ~~will~~ is on Middle Branch Moose River flowing into Black River in the town of Inlet, County of Hamilton and foot of Sixth Lake Reservoir
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the Old Forge quadrangle of the United States Geological Survey.

3. The name of the owner is State of New York

4. The address of the owner is Albany N.Y.

5. The dam ~~will be~~ is used for Storage reservoir

6. Will any part of the dam be built upon or its pond flood any State lands? All on State land

7. The watershed above the ~~proposed~~ dam is 18 square miles.

8. The proposed dam ~~will~~ creates a pond area at the spillcrest elevation of 976 acres and ~~will~~ impounds 290,000,000 cubic feet of water.

INSTRUCTIONS

Read carefully on the last page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Chief Engineer, Division of Engineering, Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

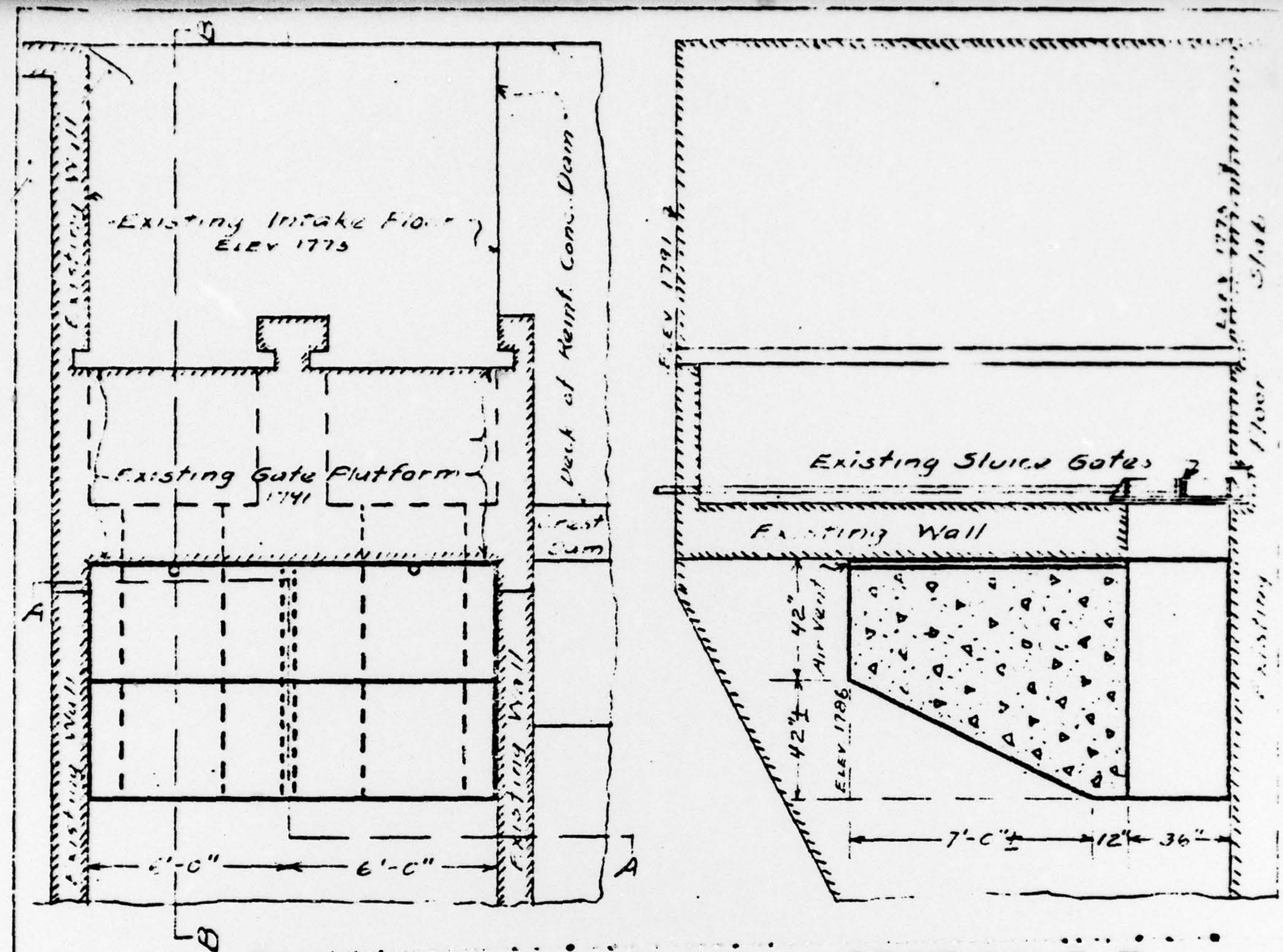
Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

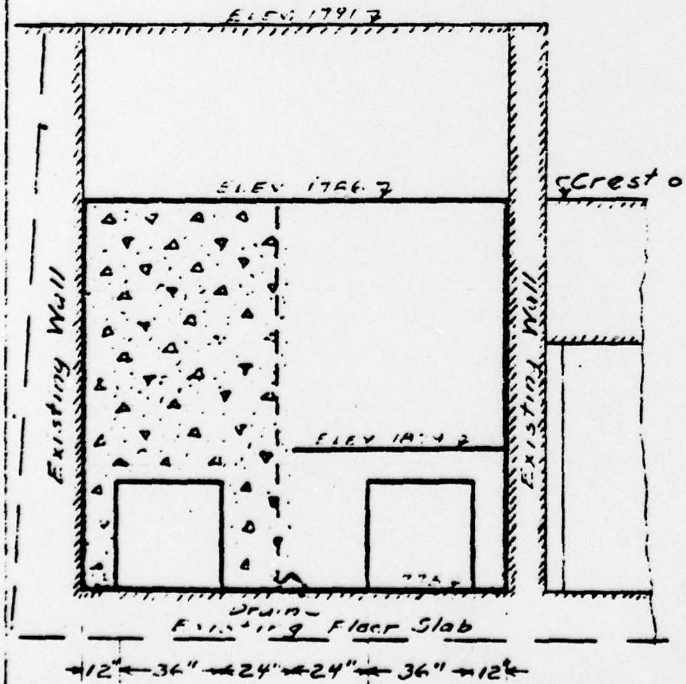
This dam was built by the State of New York in 1920 by authority of Chapter 165, Laws of 1920. Detail plans and all data required under Questions 9 to 21, inclusive, will be found in files of Inspector of Dams Department of Public Works.

The work herein contemplated consists solely of the repair of the gate wall by placing a block of mass concrete on the downstream side of said wall as shown on Plan, Acc 7252, attached hereto



PLAN

SECTION B-B



SECTION A-A

NOTES:-
All concrete 1:2:4
Air Vents to be 3" G.I. Gutter pipe or other material suitable to Engineer
Drains to be placed as directed by Engineer and to be of material acceptable to Engineer
All surfaces of old concrete before covered with new concrete to be bush hammered or cleaned and roughened as directed by Engineer.
Disintegrated concrete on face of gate bulkhead wall to be removed and grouted as directed by Engineer.

STATE OF NEW YORK
BLACK RIVER REGULATING DISTRICT
SIXTH LAKE RESERVOIR
REPAIRS TO OUTLET WORKS
1 IN = 5 FT   OCT 2, 1929
FILE:- MY-3.47   ACC 7252.

SUMMARY DATA SHEET FOR BLACK RIVER DAMS

HRBRRD

OLD FORGE RESERVOIR (1881)

Drainage Area   OF 35 sq.mi.
                   6L 17 " "
    Total   52 " "

Area, 1707   4.9 sq.mi.
                   3140 acres
                   136.6 mil.sq.ft.
Capacity, 1707   910 mil.cu.ft.
                   11.16 inches (35 sq.mi.)
                   20,290 Ac.Ft.

Elevations
  H.F.L.   1707.25
  Sp.crest   1706.00
  Gate sill   1696.8
  Runoff (35sm)   1" = 81 mil.cu.ft.
  Top Flashbds   1707.00

BM - 1709.262'

2 - 48 · 48 ... 3/...
- Coffin Valve ...
(Now Chapman Div
Crane Co)
Has 1 7/8 ... Stem
... No 3437 S No 27...
Date 10/3/27 Type ...

SIXTH LAKE RESERVOIR (1881)

Drainage Area   17 sq.mi.

Area, 1786 .... 735 acres
                        32 mil.sq.ft.
                        1.15 sq.mi.
Capacity, 1786.0   290 mil.cu.ft.
                        7.35 inches
                        6657 Ac Ft

Elevations
  Spillway crest   1786.0 (gage 10.4)
  Gate Sills   1775.0 (gage -0.6)
  Runoff   1" = 40 mil.cu.ft.
  Gate stems 2 1/2" above wheel when
   gate begins to open
  Gage on dam, lowest reading 1.70
  ~~" " crib Add 0.25 to gage to~~
              ~~get lake~~ el.

Gates (3/11/...
Size 36" x 36"
... Ludlow Valve
Crank Stem - 1" x 1" ...

33 ...

OLD FORGE AND SIXTH LAKE

Drainage Area   52 sq.mi.

Capacity   1.2 bil.cu.ft.
                     10.0 inches
                     23.1 mcf/sm

Runoff, 1" = 121 mcf

DWR DAM INSPECTION REPORT

Reconstructed

1 0	2 1		0 0 0 6 6 0	0 1 0 9 7 0	0 0 2	4
RB	CTY	YR AP.	DAM NO.	INS. DATE	USE	TYPE

140-860

AS BUILT INSPECTION no plans in file of reconstruction

- [3] Location of Sp'way and outlet
- [3] Elevations
- [3] Size of Sp'way and Outlet — Concrete File found 140-860
- [3] Geometry of Non-overflow section

[1] **GENERAL CONDITION OF NON-OVERFLOW SECTION**

- [2] Settlement
- [1] Cracks
- [1] Deflections
- [1] Joints
- [1] Surface of Concrete
- [1] Leakage
- [1] Undermining
- [2] Settlement of Embankment
- [1] Crest of Dam
- [2] Downstream Slope
- [2] Upstream Slope
- [1] Toe of Slope

[1] **GENERAL COND. OF SP'WAY AND OUTLET WORKS**

- [1] Auxiliary Spillway
- [1] Service or Concrete Sp'way
- [1] Stilling Basin
- [1] Joints
- [1] Surface of Concrete
- [1] Spillway Toe
- [1] Mechanical Equipment
- [1] Plunge Pool
- [1] Drain

- [1] Maintenance
- [C] Hazard Class
- [3] Evaluation
- [34] Inspector

COMMENTS:

Very good condition.

Dam has been reconstructed - no plans in file

APPENDIX F

GEOLOGY

APPENDIX G

GEOLOGY

Sixth Lake Dam

1. General Geology

The damsite and lake are located in western Hamilton County, New York. The rock type is a narrow band of metasediments bounded by biotite gneiss and interlayered granitic, charnockitic or syenitic gneiss. There is a reported linement trending northeast-southwest about 3 miles south of the lake, and a reported linement trending east-west about 2 miles north of the lake.

The region suffered glaciation during the Wisconsin stage and is part of the glaciated Adirondacks. Generally, a thin veneer of glacial deposits mantles the bedrock.

2. Site Geology (Interpreted from stereo-pair air photos)

The geology at the site is apparently somewhat different from the general geology. The soil cover appears thick and no rock outcrops are visible. However, the presence of "hills", especially NNE of the dam, may indicate high rock. The rock will be metasediments (sedimentary rocks which have undergone the lowest grade of metamorphism; rocks will retain primary sedimentary structure, i.e. bedding, worm burrows, flute casts, etc.).

For the most part, lake slopes look fairly flat. There is a considerable concentration of homes downstream. Damage will be done should the dam be overtopped and fail. Downstream channel looks wet and vegetated.

Highway embankment (south of lake) shows signs of erosion. Lake inlet shows a siltation plume. Upland banks north of lake show minor erosion channels.

There were no geologic features (stratification, faults, cavities, etc.) detected or suspected that could be expected to affect the dam or its appurtenant structures adversely.